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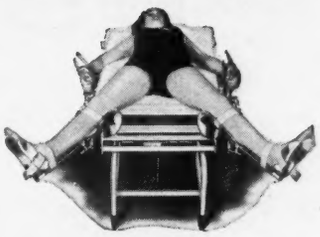

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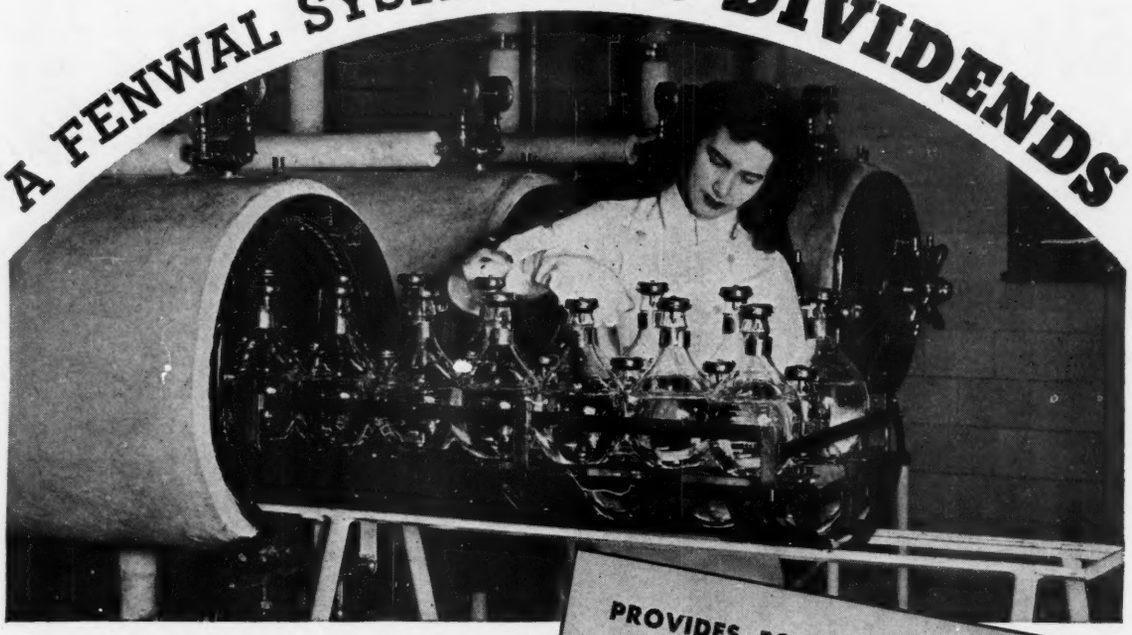

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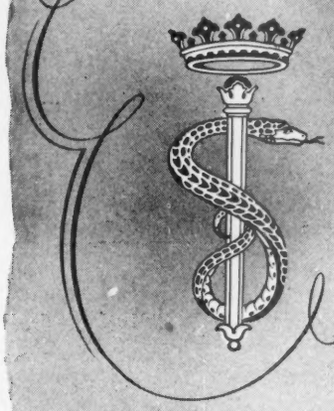

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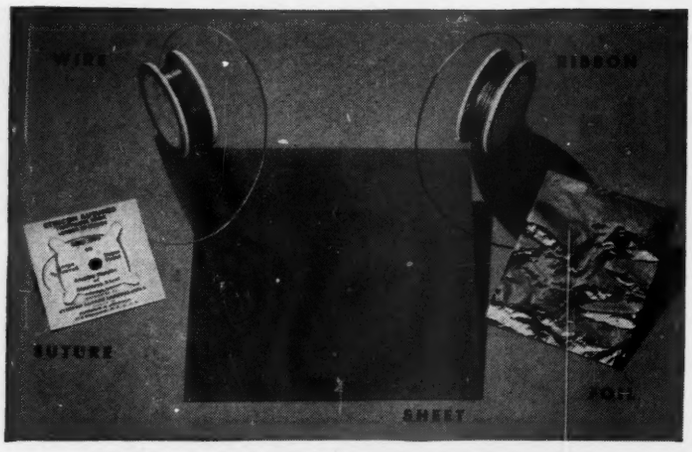

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1. *Blain, A. W. and Campbell, K. N.—Arch. of Surg., 44:1117, (June) 1942.*
2. *Hulse, William F.—Arch. of Otolaryngol., 37:831, (June) 1943.*
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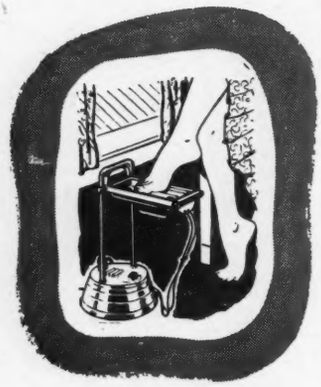

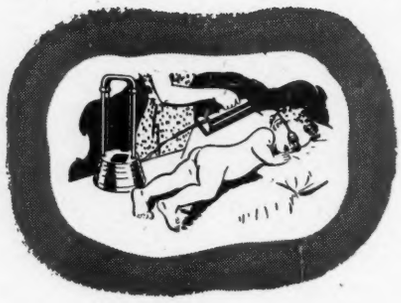

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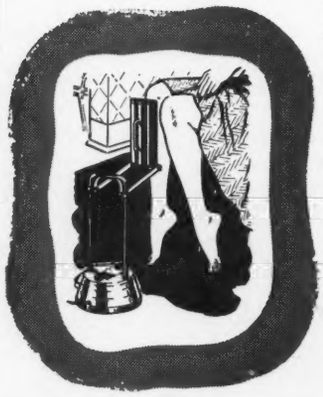

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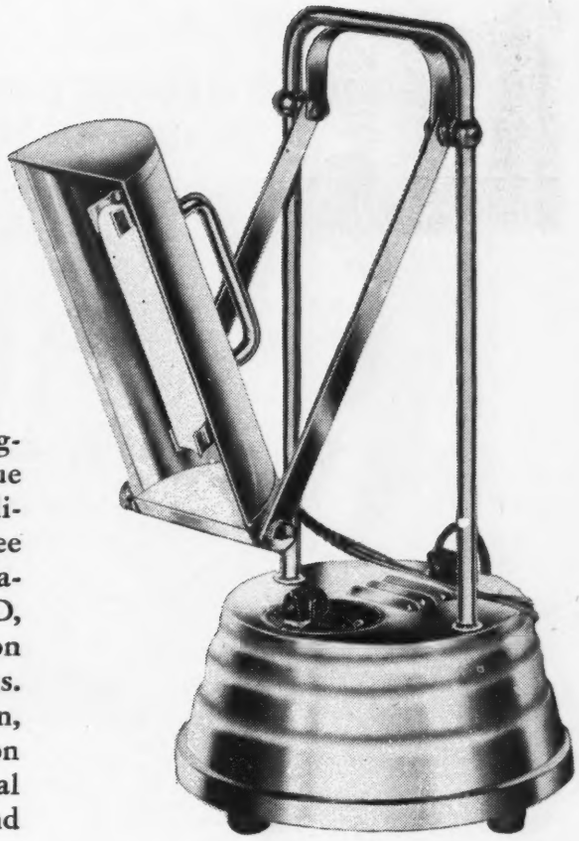

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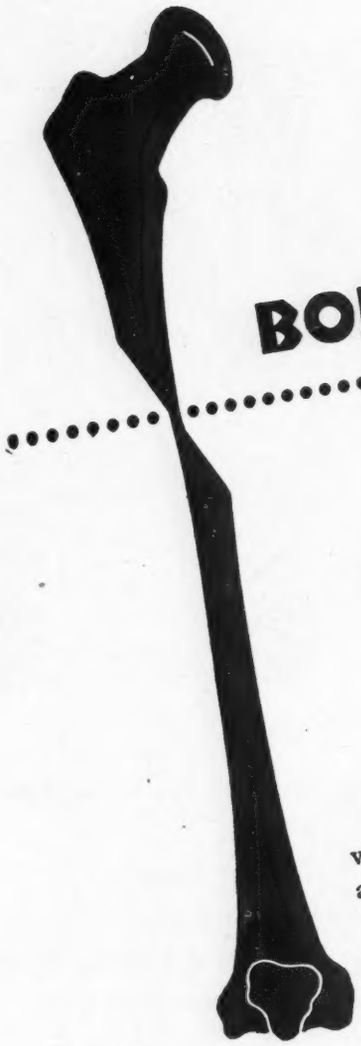

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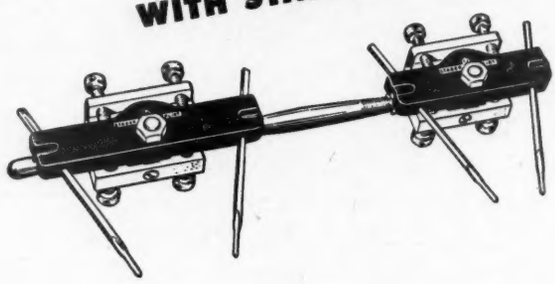

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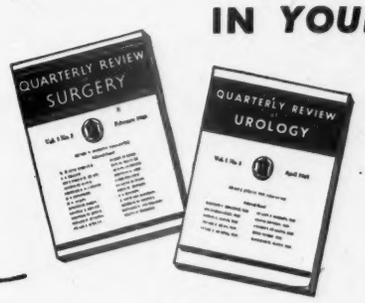

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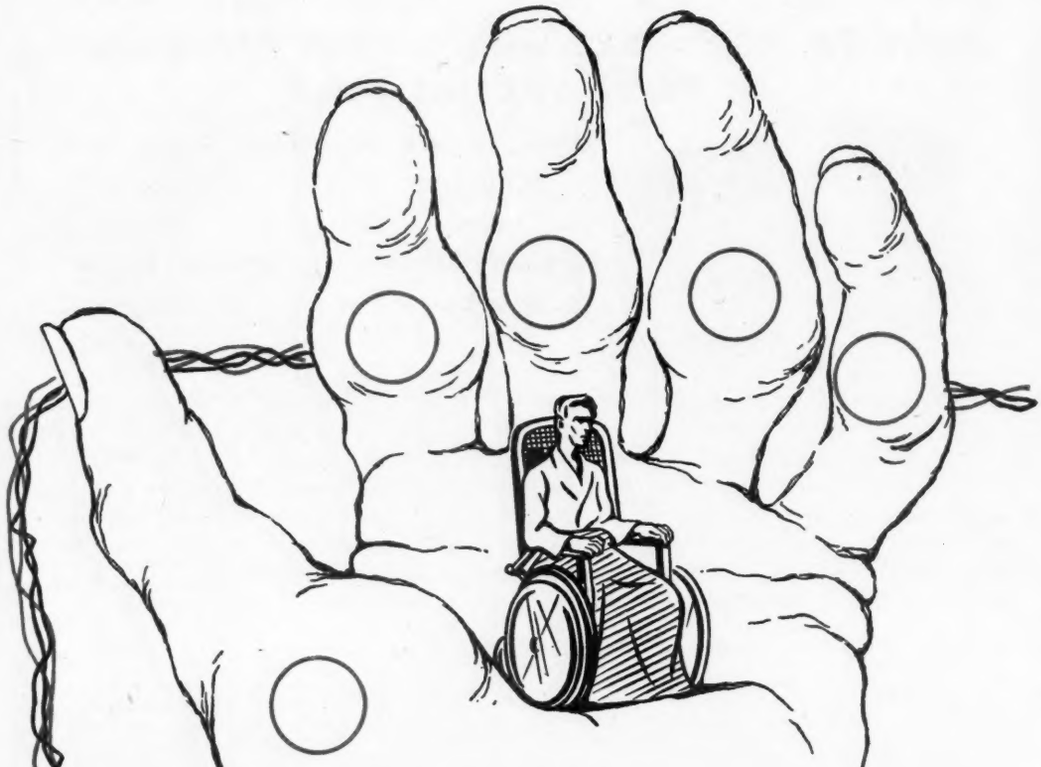

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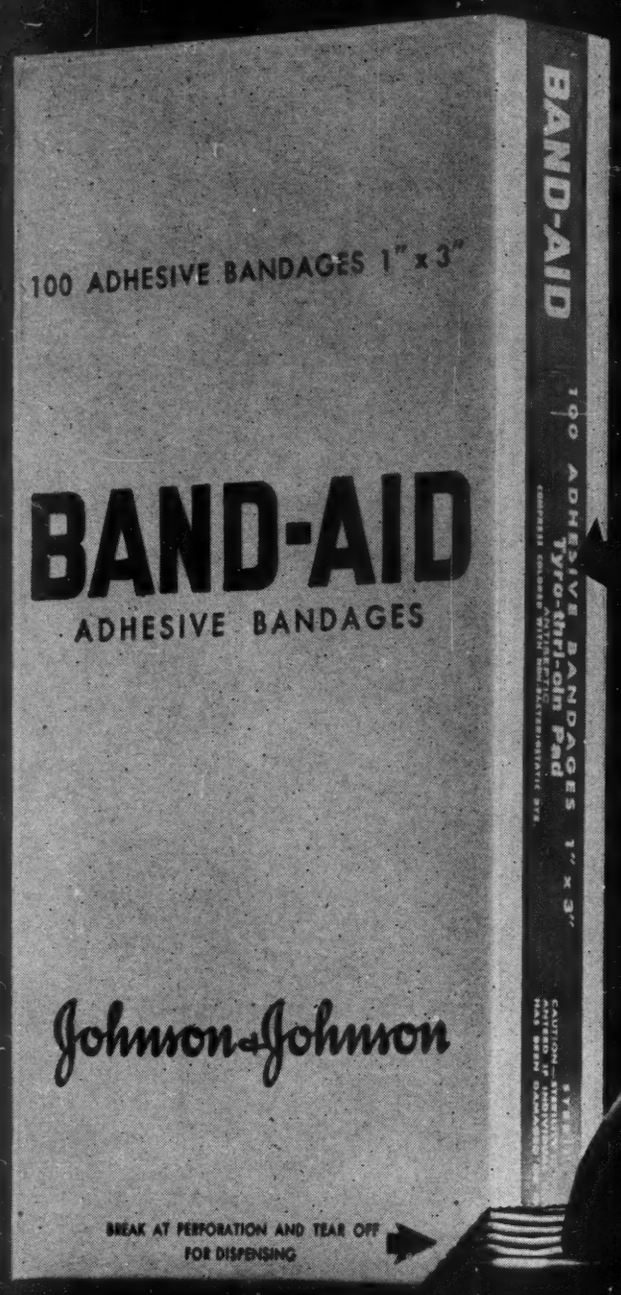

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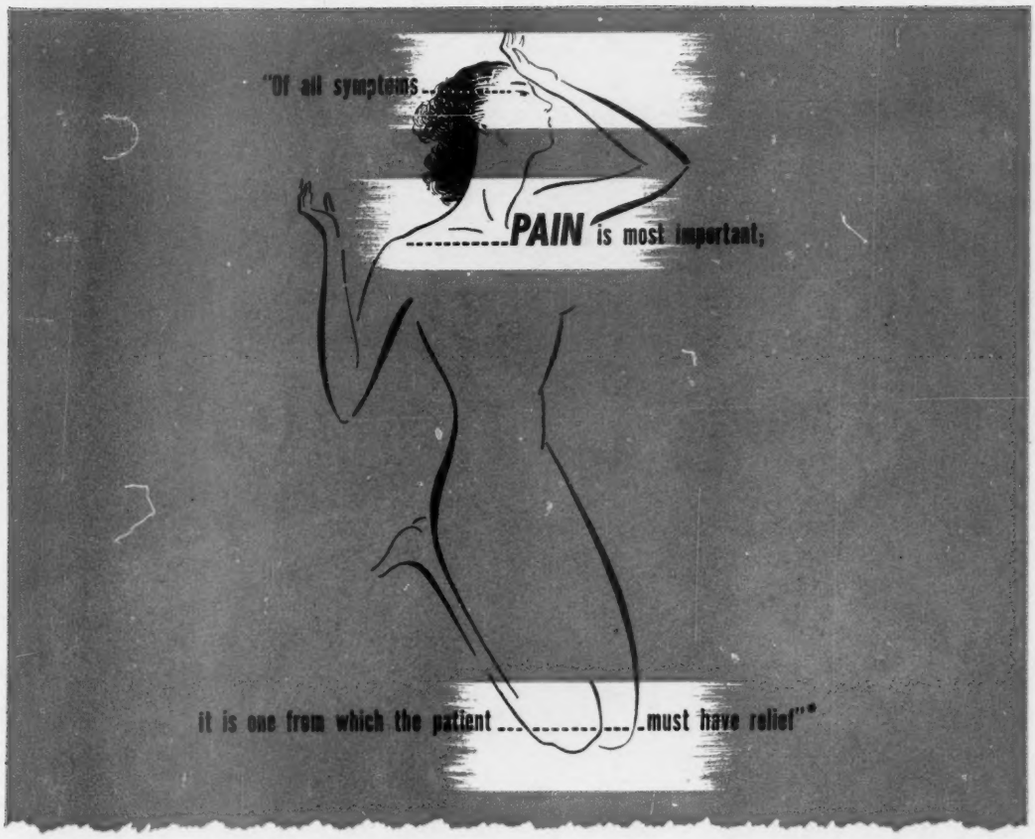

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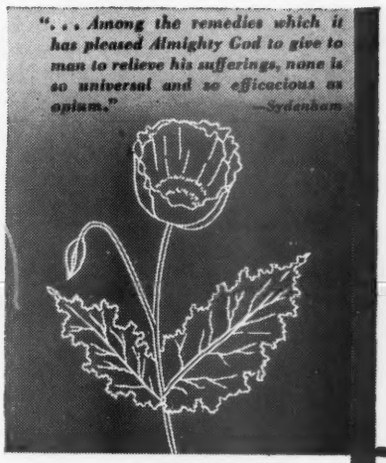
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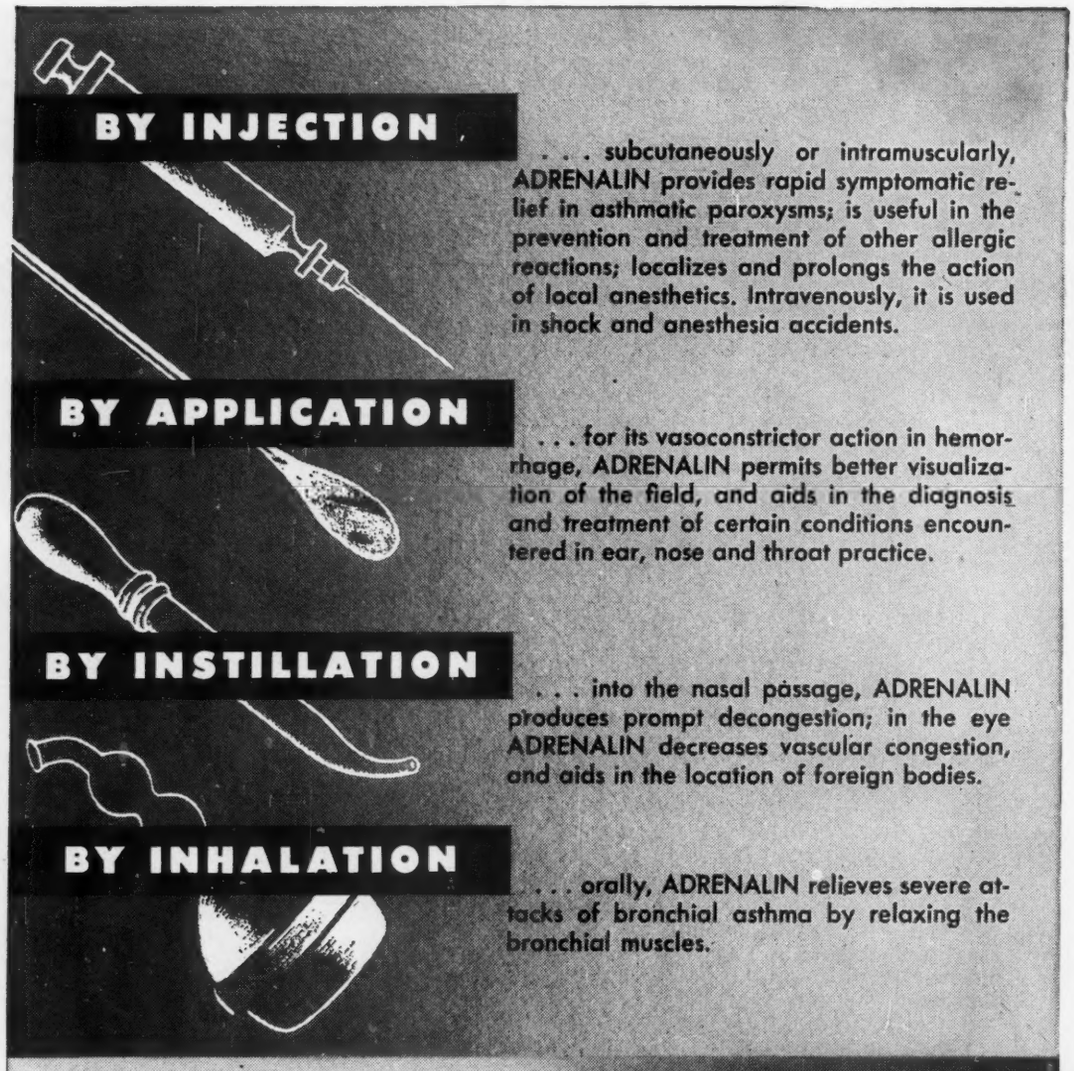
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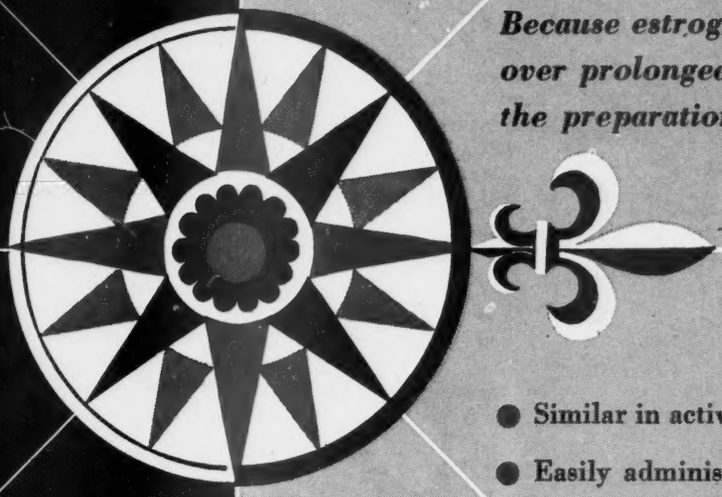

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(1) *Lennox, W. G. (1945), Petit Mal Epilepsies: Their Treatment With Tridione, J. Amer. Med. Assn., 129:1069, December 15.*
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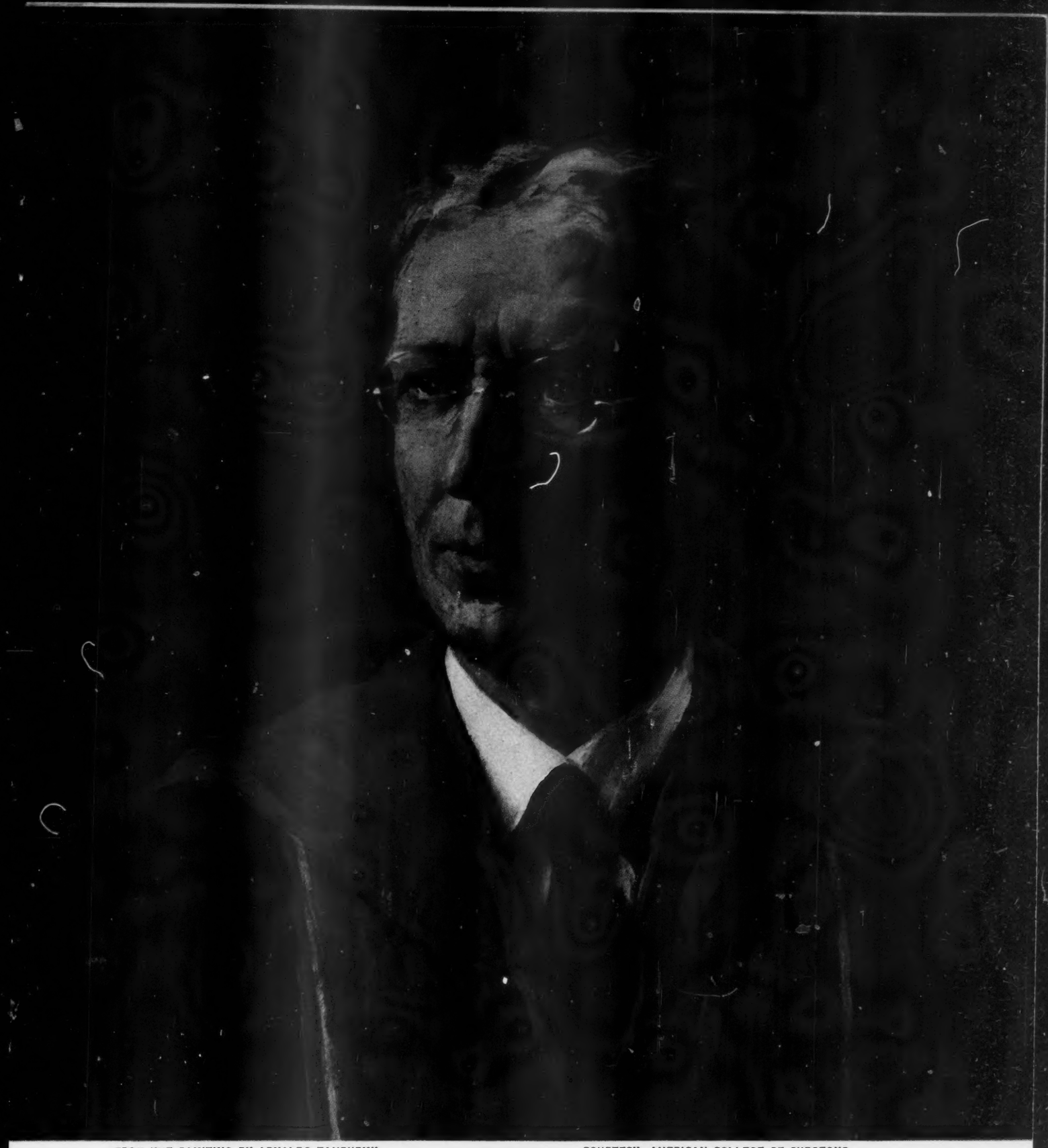

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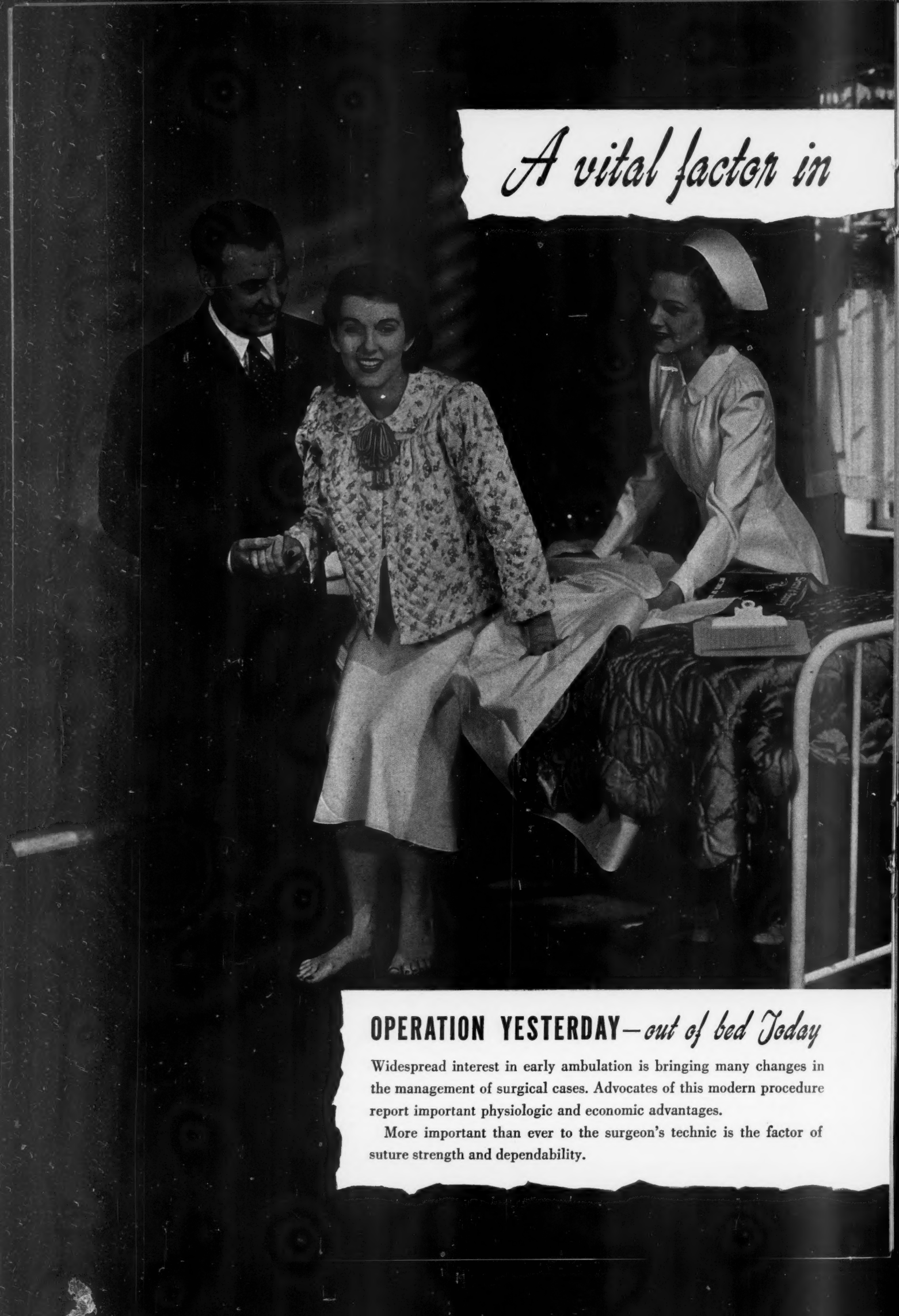

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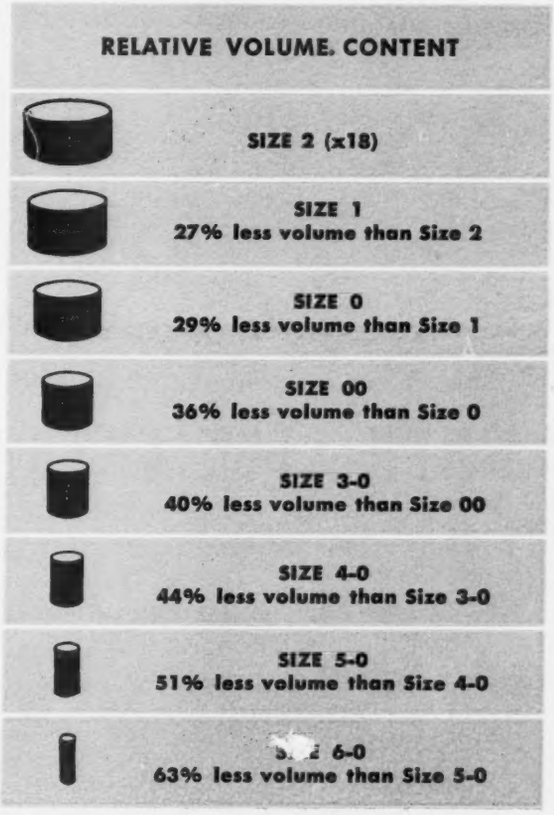

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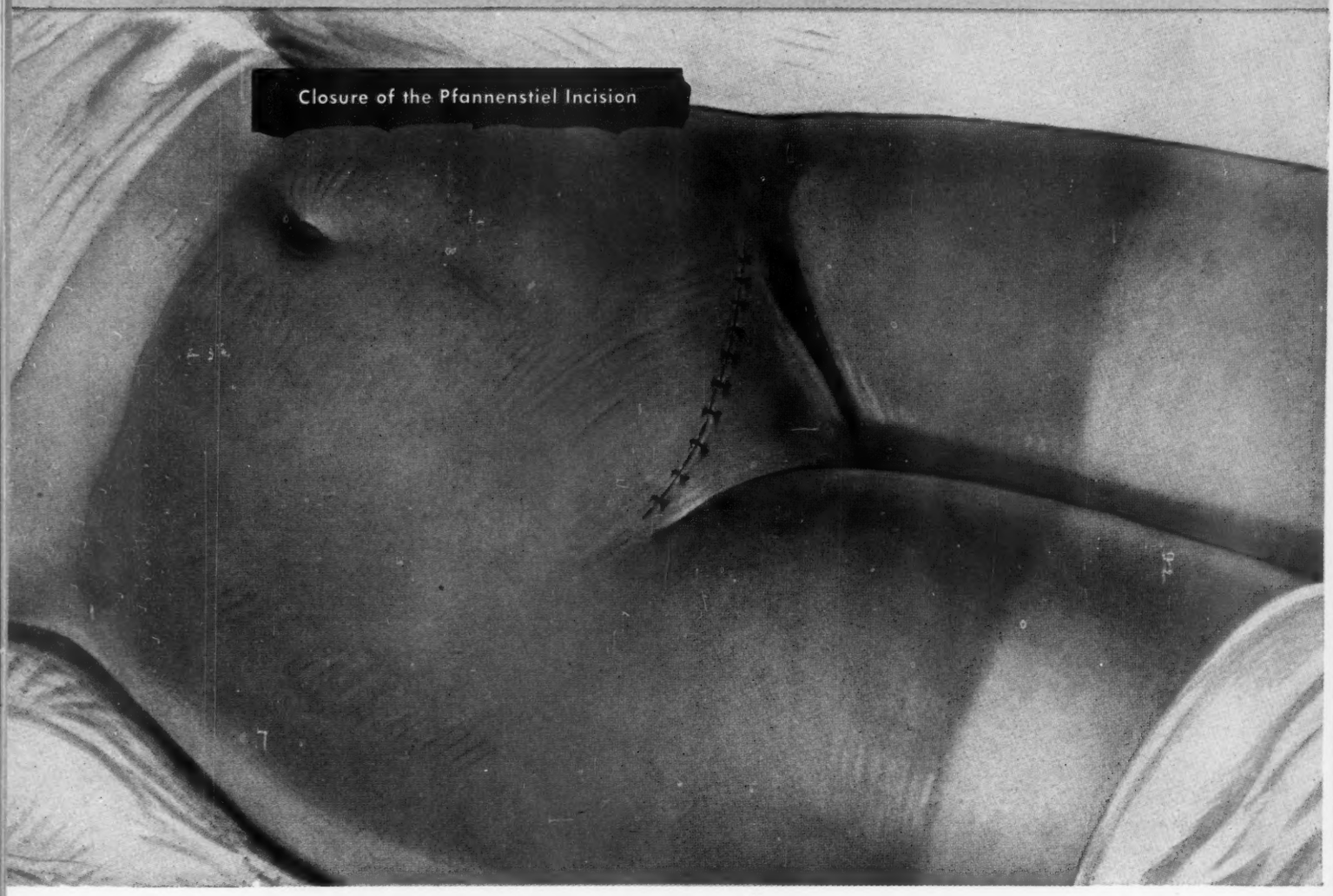

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Editorial

MANAGEMENT OF ADVANCED CANCER*

IN stressing the need for the intelligent treatment of advanced cancer, we accomplish a dual purpose: In the first place, we guarantee, measurably, the better treatment of a group of patients so deplorably in need of help; and in the second place, we broaden our knowledge of the disease. It has been stressed so emphatically and so frequently, of late, that more intensive research offers the largest measure of hope of conquering the ogre cancer, that this truth does not have to be emphasized. What may be mentioned with profit, however, is the fact that clinical research and laboratory studies are, or, if they are not, should be inseparable handmaidens. In the field of clinical research, the advanced cases of cancer constitute a veritable gold mine of still unexplored possibilities. Peripheral spread, regional and remote metastases, variations in the duration and course of the disease, dependent upon organs involved, or upon diet, or constitution or genetic background, the riddle of cachexia, these and many other unsolved puzzles may be studied with the greatest possible advantage in patients suffering from advanced cancer.

In order to avoid confusion of mind and consequent snarled thinking, one ought to establish, at the outset, what we mean by "advanced cancer." We may elect to regard the phrase as signifying progress of the disease to the point where, due to the size of the tumor, extensive ulceration, lymph node involvement, duration of the illness, or incapacity of the patient, it is perfectly clear that the disease, although in the advanced stage of its development, is nevertheless still operable; or we may elect to deal only with that type of advanced cancer in which, owing to the advanced state of the disease, it has become inoperable.

This paper limits itself to that group of patients who have emerged from the status of operative cure into the unfortunate plight of inoperability. It is both reasonable and justifiable to frame our thoughts with such narrow limits; because if we elected to include operable cancer, the discussion naturally would be diverted into channels of method and technic of applying that treatment. Such a discussion, covering the whole field of various types of cancer, invading various tissues and organs, might prove to be too wide in scope. On the other hand, limiting the field strictly to a consideration of advanced, inoperable cancers furnishes an opportunity for discussing a group of patients

* From the Department of Pathology, The Barnard Free Skin and Cancer Hospital, St. Louis, Missouri. Read at the Sectional Meeting of the American College of Surgeons, St. Louis, Mo., January 31, 1946.

who are, literally, the flotsam and jetsam in this particular realm of surgery.

At the very outset, we may lay down two fundamental propositions: (1) There are patients with cancer who are beyond the scope of surgical cure. If these patients, as a result of undue surgical zeal, are subjected to radical operative attack they may be compromised even in excess of the disability and suffering incident to the disease untreated. (2) There are at the command of surgeons, tried and proved measures of palliation in cancer that may be practiced with such happy results as to be satisfying both to the intelligence and the conscience of the surgeon, even though they offer not a glimmer of hope of cure.

There may be, and there frequently is, a rather narrow dividing line between the indications and the contraindications to radical surgery; but this is a common situation in the field of surgery in general and calls for no special comment. Then too, there is a partial shadow zone in which it is difficult to support conviction by action. For example, I should never counsel radical breast amputation in the presence of supraclavicular lymph node metastasis; but I have never been in unqualified disagreement with, or even mildly condemnatory of a competent surgeon who, in a given instance, elected to differ with me on this point. I, myself, do not find it possible to agree with all evidences of inoperability in cancer of breast as set down by Haagensen and Stout,* although in general, I concur in the concepts that they set down regarding inoperability. The point is that universal and unalterable postulates cannot be established.

But we may emphatically reject those judgments which underlie massive cervical lymph node resections in undeniably inoperable patients; or jaw resections in those patients who will face an almost inevitably dismal future horribly deformed, dripping saliva and unable to eat or drink with even the remnant of comfort that was theirs before treatment; or radical rectal resections with scattered mesenteric lymph node enlargements plus a solitary metastasis in the liver. Such surgical exercises as these do not constitute malpractice in the legal sense; they are not evidences of surgical misconduct, but they represent what may fairly be interpreted as overaction on the part of surgeons goaded by the combination of fear, horror and despair incident to the chapter of cancer in general and to advanced cancer in particular.

The objections herein voiced are not based on the mere performance of unduly radical operations; but rather on the uselessness, even the harmfulness of fruitless surgery. No procedure is to be condemned on the mere fact that it is radical. The sole criterion must be the probable degree of help or surcease that may be afforded the patient. To lop off a leg or an arm, useless and painful from inordinate lymphedema, or pathological fracture; to perform the operation of a simple mastectomy for a foul, fungating, malignant ulcer redolent with stench; to make any of the various ostomies for inoperable cancer of the gastrointestinal tract; to decompress the brain for relief of pain or approaching blindness, all of these palliative procedures should, on any count, have the blessing of deity and man, because they are planned to lighten the load and the lot of individuals descending the path of distress and pain, into the valley of oblivion.

There is one hazard—a purely psychological one—incident to withholding surgical aid from the inoperable cancer victim. The patient of average intelligence afflicted with advanced cancer is suspicious of his plight in a large percentage of instances. He clings avidly to Pandora's box, the lid of which he clutches closed lest hope itself, his one remaining asset, should escape. When the surgeon refuses operative interference, the patient almost inevitably concludes that he is beyond physical salvation; and unless he be a philosopher in the truest sense of the word, he begins to sink into a slough of despond-

* Haagensen, C. D. and Stout, A. P. Carcinoma of the breast. *Ann. Surg.*, 118: 859, 1943.

ency. A resourceful surgeon knows how to correct this mental ill; and I for one am all for correcting it even at the sacrifice of dalliance with truth. Many ruggedly honest but humanly minded surgeons who have champed all the chaff about telling the patient "the truth, the whole truth and nothing but the truth" still believe, with Emerson that "God offers to every mind its choice between truth and repose. Take which you please, you can never have both."

The gospel of surgical conversatism in the treatment of advanced cancer does not warrant the conclusion or even the inference that a policy of *laissez faire* must be the order of the day. A great deal can be done to alleviate the advanced cancer victim. The intelligent application of radiotherapy, for example, can accomplish much in selected cases, both in checking the advance of the growth of the tumor and in subduing pain; particularly is this true in cases of skeletal metastases with intolerable pain; but also, on occasion one sees severe pain subdued by radiotherapy in cases of inoperable abdominal carcinoma. In extensive surface ulcerations that are heavily infected and actively suppurating, the newer antiseptics, sulfa drugs and penicillin, may lessen both discharge and odor. At times the cautery serves the same or better purpose. Iodoform, charcoal and in particular, acetone, are occasionally useful in the same way. Castration, by actual gonadectomy in male and female, or by radiotherapy in the female or by hormonal therapy in either sex, furnishes a new technic that, in some instances, such as prostatic and mammary cancer with remote and particularly with skeletal metastases, is followed, not infrequently, by results that are almost incredible. And finally, there are the alkaloids of opium. The patient in the advanced stages of cancer has the first claim on DeQuincey's thought, "Thou hast the keys of Paradise, O just, subtle and mighty opium!" In the last analysis, it is the sheet anchor against the agonal tragedies of cancer. And I lean more and more toward the idea of even freer use of this drug, earlier in the disease than I formerly administered it. I fear less and less the bug-bear of an acquired immunity, and I have come more and more to believe that the necessary and inevitable increase of dosage brings with it a subtle sort of synergistic drug toxemia that induced an earlier end to what is probably the most tragic of all other of Nature's cat and mouse tragedies.

M. G. Seelig, M.D.

Original Articles

SURGICAL TREATMENT OF JEJUNAL ULCER*

LAURENCE S. FALLIS, M.D. AND KENNETH W. WARREN, M.D.
DETROIT, MICHIGAN BOSTON, MASSACHUSETTS

THE physiologic consequences of gastrojejunal anastomosis range from triumph to tragedy, and afford the surgeon a few of his finer moments and some of his greatest grief. Performed primarily for the relief of the most unresponsive types of duodenal ulcer, the procedure of gastro-enterostomy is followed not infrequently by jejunal ulceration, a lesion more intractable, more disabling and more subject to serious complication than primary gastroduodenal ulcer. This distressing consequence of the artificial gastro-enteric stoma has brought disfavor to the procedure of simple gastro-enterostomy and a measure of disappointment to the advocates of partial gastrectomy as a means of avoiding this complication of the surgical treatment of peptic ulcer.

INCIDENCE

The incidence of jejunal ulceration following gastro-enterostomy is variously quoted from 1.7 to 34 per cent.[1] Such a wide discrepancy is difficult to analyze and impossible to reconcile, but we believe that Lahey's estimate of an incidence of 15 per cent is a reasonable approximation of the true figure. Essentially a complication of the surgical treatment of duodenal ulcer, it is rarely encountered following gastro-enterostomy performed for the relief of gastric ulcer or carcinoma. That the frequency of secondary ulceration following partial gastrectomy is considerably less than after simple gastro-enterostomy is generally accepted. The recorded incidence from resection varies between 0.5 and 10.0 per cent.

LOCATION

The descriptive term, marginal ulcer, while occasionally accurate, is, in the broader sense, a misnomer; for the majority of these ulcers are situated entirely within the jejunum, either opposite the stoma or in the efferent region, a few centimeters distal to the anastomosis. The afferent loop is singularly immune to ulceration. It is believed that marginal ulcers begin as jejunal lesions and spread by peripheral expansion to involve the gastric mucosa. In a series of ten patients operated upon in the Henry Ford Hospital during the past year for "marginal ulcer" nine of them had their lesion entirely within the jejunum, and only one patient demonstrated involvement of the gastric mucosa, and even this ulcer was essentially jejunal in location. In no instance was the afferent loop affected.

The location is significant. First, it reflects the increased sensitivity of jejunal mucosa to gastric secretion, and secondly, it demonstrates the beneficent rôle that the alkaline contents of the duodenum play in protecting the afferent region from erosion. In view of the predominant location of these lesions it would be more accurate to call them either jejunal or anastomotic ulcers, as suggested by Marshall.[3]

ETIOLOGY

The definitive etiology of jejunal ulcers is unknown in the same fundamental sense that the cause of gastroduodenal ulceration is still a mystery. There are, nevertheless, some factors which are present with such consistency as to gain widespread accept-

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ance as causative agents. Foremost among these are the three emphasized by Ochsner; (1) an inherited constitutional predisposition to form ulcers, (2) a tissue susceptibility to ulceration, and (3) an increased acidity of gastric contents.

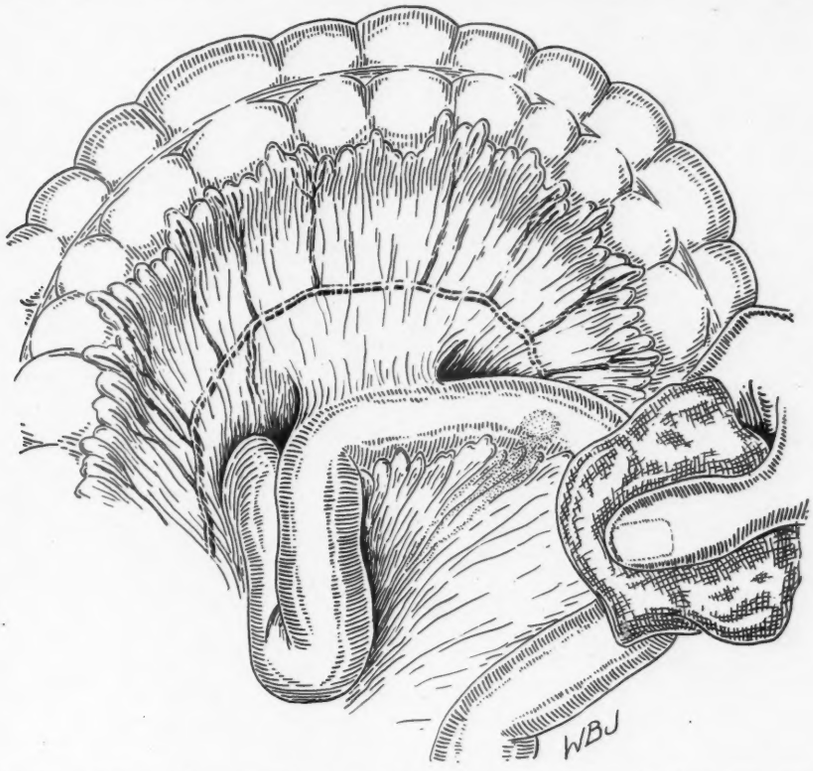

Fig. 1. Jejunal ulcer distal to gastrojejunostomy stoma. Note induration extending into the mesentery.

The first is fundamental but immeasurable. The patients who develop jejunal ulcers are, as Walters and Claggert[4] so aptly designate them, "ulcer formers." They are a select, if unenviable, group in the sense that their original ulcers were persistently severe and unresponsive to medical management. They are further distinguished by virtue of their previous record of frequent and threatening complications of their initial peptic lesion, such as massive hemorrhage and free perforation.

The theory that rupture of a gastroduodenal ulcer bestowed some curious protection upon the victim with respect to future difficulty has been largely discredited. The patient who has a perforation of a gastroduodenal ulcer is prone to have subsequent trouble, and, if subjected to surgery, is perhaps less likely to have an entirely satisfactory result than is the ulcer patient who has not experienced this difficulty. It is interesting, if not statistically significant, to observe that one-third of the patients upon whom we have operated for jejunal ulcer have had a previous perforation of a gastroduodenal ulcer.

Furthermore, the patient who suffers a rupture of a postoperative jejunal ulcer will have had, in many instances, a former perforation of a gastroduodenal lesion. While multiple perforations of a primary peptic ulcer are relatively rare, jejunal ulcers are more subject to recurrent rupture. It would appear that some patients exhibit not only an ulcer forming diathesis, but equally important a perforative tendency.

It is an easily demonstrable fact that tissue sensitivity of the intestinal mucosa to gastric secretions increases in direct proportion to its distance from the pylorus. Thus patients who, as a result of surgical

error, have had a gastro-ileostomy will have, in many instances, ileitis or ileal ulceration.[5] But above and beyond this

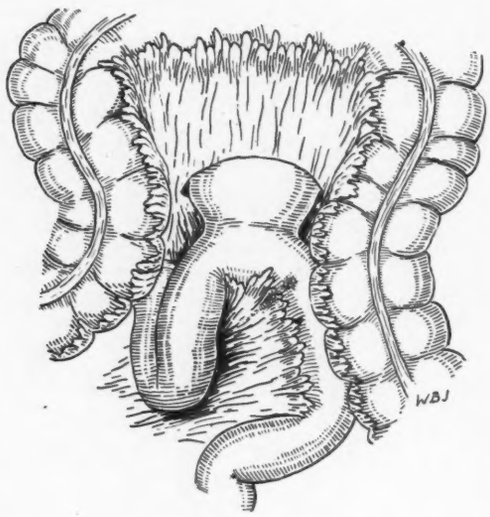

Fig. 2. Mesocolon detached from anastomotic area.

usual sensitivity, the jejunal ulcer victim exhibits an increased intolerance to the presence of undiluted gastric secretion in the small bowel.

The importance of increased acidity of gastric contents as an etiologic determinant is generally conceded. This contention is supported by the fact that postoperative ulcers are rarely seen in the absence of excessive acid values. They are practically unknown following gastro-enterostomy or gastrectomy for ulcer or carcinoma of the stomach, and they almost never involve the afferent loop because of the presence of the highly alkaline duodenal contents. The superiority of gastrectomy over gastro-enterostomy in the surgical treatment of duodenal ulcer is predicated essentially upon the fact that the more radical resection significantly lowers the postoperative acid value. The failures of this procedure can usually be traced to its inability to reduce gastric acidity consistently and permanently.

The rôle of surgical technic, non-absorbable suture material, intestinal clamps and the mechanical trauma from the impingement of the gastric chyme on jejunal mucosa in the production of post-

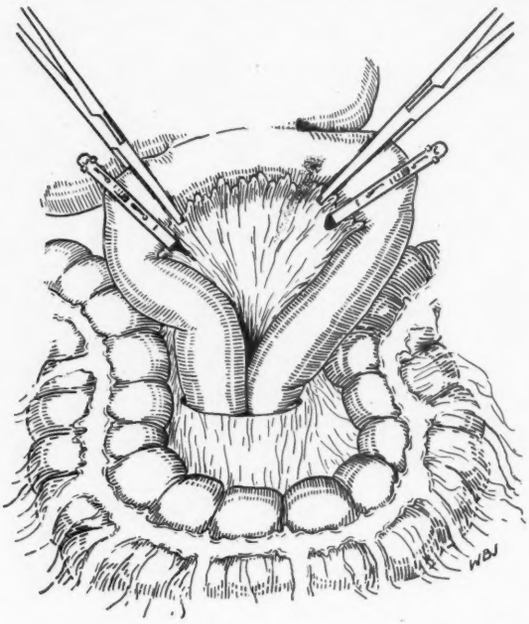

Fig. 3. Retraction of anastomotic area with afferent and efferent loops of jejunum into supracolic compartment. Clamps applied preparatory to resection.

operative ulcer was once thought to be considerable, but now is regarded as relatively unimportant.

The tendency of anastomotic ulcers to occur predominantly in the male is even more pronounced than in gastroduodenal ulceration. Nine of our ten patients were men. This fact is consistent with the observation that peptic ulcer, in addition to being less common in females, is better tolerated by them.

Jejunal ulcers commonly affect the young. Approximately one-half of our patients were under thirty-five years of age and only two were over fifty-five.

In general, postoperative jejunal ulcers occur in young adult males who have had a gastro-enterostomy for the relief of a duodenal ulcer that had been the site of one or more serious complications, and in whom the surgical procedure had been followed by a persistently high gastric acidity.

SYMPTOMS

The symptoms of jejunal ulceration are not unlike those of primary gastroduodenal ulcer and still are not identical. The pain is gnawing and burning in character, but it is located to the left of the midline about the level of the umbilicus instead of being in the epigastrium. It is less rhythmic than primary ulcer pain and considerably less responsive in both a symptomatic and strict therapeutic sense to the ingestion of selected foods and alkali.

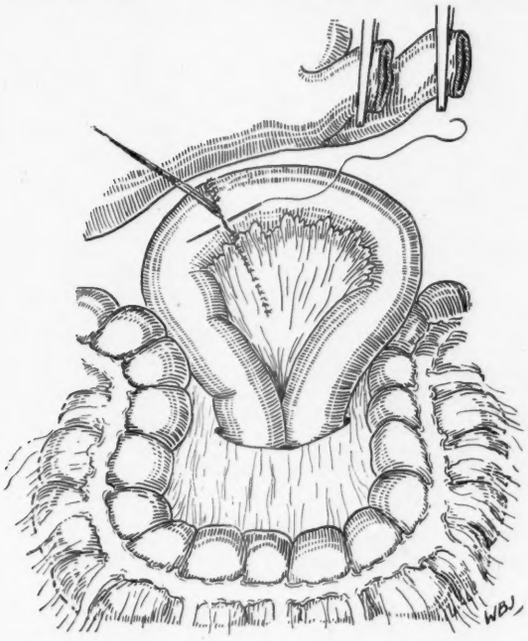

FIG. 4. End-to-end anastomosis of jejunum restores intestinal continuity.

Like gastroduodenal ulcers, jejunal erosion may occur and, indeed, progress to serious complications with surprisingly few digestive symptoms. One of our patients, whose anastomatic ulcer perforated, was awakened by excrutiating pain indicative of rupture without having had any prodromal symptoms suggestive of recurrent ulceration. But in general the pain is more severe, more chronic and more diffuse than primary ulcer distress.

COMPLICATIONS

The serious complications of jejunal ulcer are hemorrhage, free perforation and gastrojejunocolic fistula.

Massive hemorrhage may be the first indication of the presence of a jejunal ulcer, and, as a general rule, bleeding which occurs some time after gastro-enterostomy is due to an anastomatic lesion rather than to reactivation of a primary peptic ulcer.

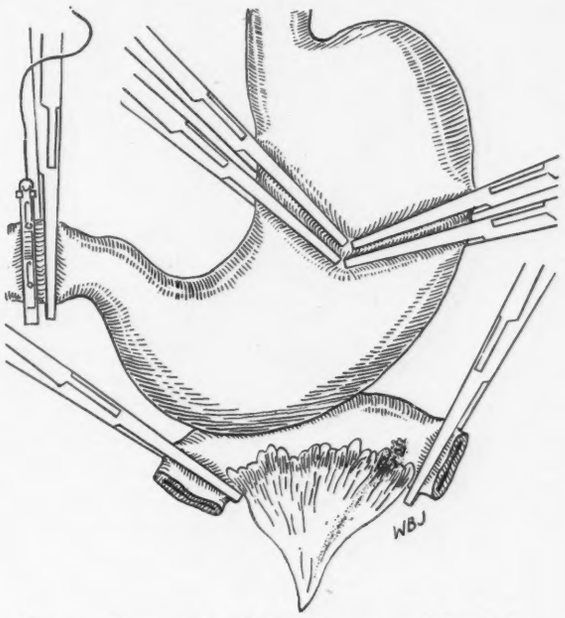

FIG. 5. Stomach and duodenum mobilized for resection. Note angle at which gastric clamps are applied.

Perforation of jejunal ulcers is rare in the sense that only a small number have been observed and recorded, but it is a relatively common complication among patients who have jejunal ulcers. Bracci,[6] in 1937, collected approximately 200 cases from the literature.

Singer and Meyer[7] pointed out the perforative tendency in patients who had experienced rupture of a jejunal ulcer and also emphasized the predisposition to recurrent perforation. In a patient presenting evidence of a ruptured ulcer following gastro-enterostomy or gastric resection, the lesion will be found, almost invariably, in an anastomatic ulcer, and, in a majority of cases, the victim will have had a previous perforation of a gastroduodenal ulcer. We have observed four perforations in three patients, two of whom had suffered an earlier rupture of a primary peptic lesion.[8]

The problem of gastrojejuno colic fistula will not be considered in this presentation.

DIAGNOSIS

Confirmatory *x*-ray diagnostic evidence is often wanting, especially when the ulcers are situated in the efferent loop of jejunum at some distance from the stoma. Recognition of these ulcers then necessarily has to be based on clinical grounds. Though some jejunal ulcers are silent until manifested by perforation or hemorrhage, recurrence of ulcer symptoms after operation is prima facie evidence of jejunal ulcer.

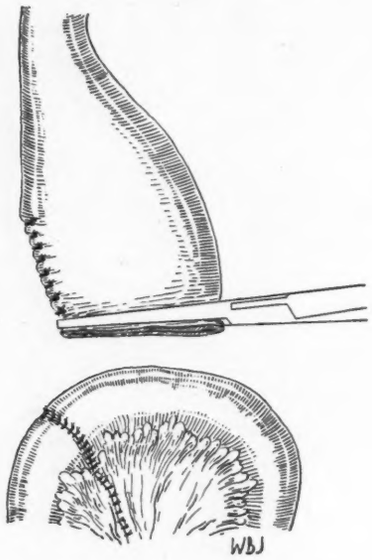

FIG. 6. Tube-like appearance of remainder of stomach after closure of the upper portion. Spleen and short gastric arteries are not depicted.

TREATMENT

Intensive medical therapy is tried in almost every instance of jejunal ulceration, but the response is generally poor, and most of the victims are subjected to surgery without undue delay.

Preoperative Preparation. In addition to the usual preoperative preparation for gastric resection, it is important to cleanse the colon thoroughly before operation because the jejunal ulcer may be adherent to the colon, and in the process of separation this viscus also may be inadvertently entered. Blood should be drawn from at least two cross matched donors since the operation is time consuming, and the patient requires protection against shock.

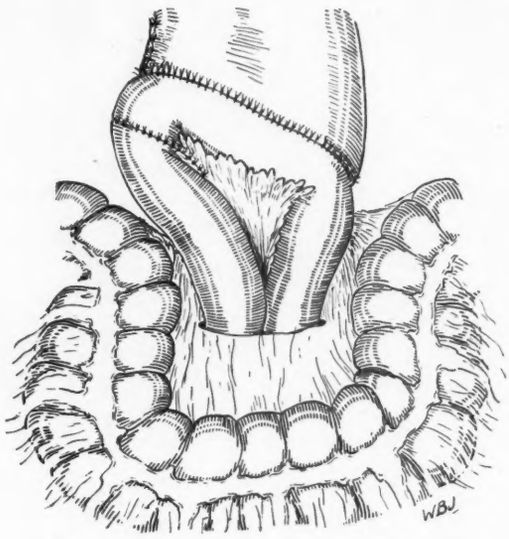

FIG. 7. Retrocolic isoperistaltic anastomosis completed.

Operative Technic. Under nupercaine 1–1500 or continuous spinal anesthesia the scar of the previous upper abdominal incision is excised and the abdominal cavity is entered preferably through the linea alba. The great omentum is freed from its attachment to the anterior abdominal wall in order to mobilize the transverse colon and any other abdominal adhesions are separated. The duodenum is next inspected for evidence of reactivation of the original ulcer though we have not found the coexistence of an active duodenal ulcer and a jejunal ulcer in any of our patients. The transverse colon is now elevated into the wound to allow for investigation of the stoma and the efferent loop of jejunum. Chronic ulceration of the jejunum manifests itself by induration and thickening of the involved area which in our experience is situated on the efferent loop either opposite the stoma or as far distally as 10 cm. The area of ulceration usually is close to the mesenteric border so that the accompanying induration extends into the mesentery. (Fig. 1.)

The first step, except in those cases in which an ante-colic anastomosis has been made, is to detach the transverse mesocolon from the anastomotic area exercising great care not to injure the middle colic artery. (Fig. 2.) The gastrocolic omentum is then sectioned to permit retraction of the anastomosis and the involved area of jejunum into the supracolic compartment. (Fig. 3.) We have found that resection of the segment of jejunum containing both the anastomotic site and the ulcerated area with its adjacent mesentery is a simpler procedure than lysis of the gastrojejunostomy and wedge resection of the ulcer. Moreover, intestinal continuity is easily restored by a closed type of anastomosis, thereby minimizing the soiling which accompanies the taking down of the gastroenterostomy and plastic procedure on the jejunum. After the triangular area of mesentery is prepared for removal, two Furness clamps, the McClure modification with the detachable handle is particularily useful in this location, are applied to the jejunum proximal to the anastomosis and distal to the ulcer. Kocher clamps are put on distal to the upper Furness clamp and proximal to the lower one (Fig. 3), and the bowel is sectioned with the cautery between the Kocher and Furness clamps. The stomach and short jejunal loops are held out of the way while continuity of the jejunum is being restored by an end-to-end closed anastomosis. (Fig. 4.) This maneuver can be carried out only if the proximal loop is of sufficient length to permit application of the clamp. In one of our patients the afferent loop was so short that an open end-to-end anastomosis had to be performed. Mobilization of the ligament of Treitz is helpful when difficulty is experienced. Closure of the opening in the mesentery completes this step. If the previous operation has been a gastroenterostomy, subtotal gastric resection is then performed. The duodenum is sectioned at the pylorus and closed. After ligating the main blood vessels, Ochsner-Kocher clamps are applied in pairs to both the greater and lesser curvatures and the lower three-fourths of the stomach is removed. If the clamps are put on obliquely at an angle of 135 degrees (Fig. 5) instead of transversely, closure of the portion of stomach held by the clamp applied from the lesser curvature side will allow the stomach in the grasp of the remaining clamp to be drawn out in the form of a tube. (Fig. 6.) Isoperistaltic retrocolic terminolateral gastrojejunostomy is then effected with two rows of sutures, an inner of continuous chronic catgut, and an outer of interrupted fine silk su-

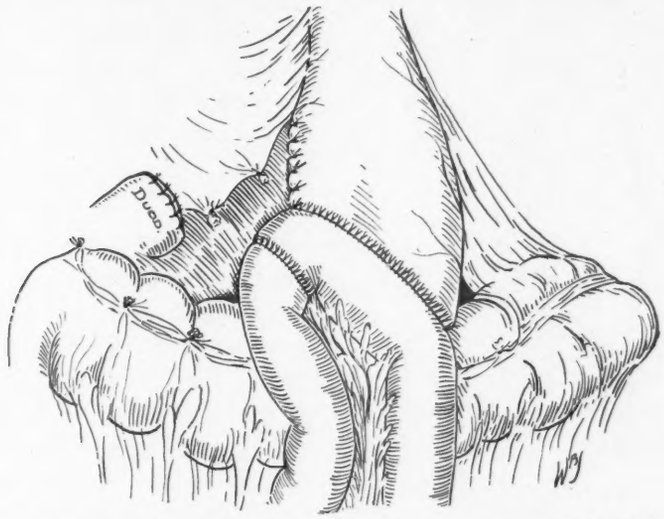

Fig. 8. Antecolic anastomosis indicated for recurrent jejunal ulcers and for ulcers appearing after partial gastrectomy.

tures. The anastomosis of course is distal to the restored jejunum. (Fig. 7.)

In those instances in which the jejunal ulcer has followed a partial gastrectomy

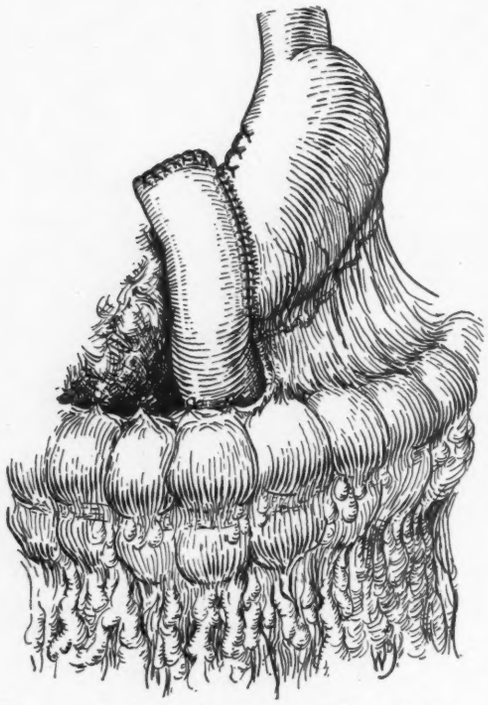

FIG. 9. Gastroduodenostomy, Von Haberer-Finney technic; alternative method of restoration of continuity.

there is an absolute indication for removal of more gastric tissue. In this group of cases it is prudent as Lahey points out to make an antecolic type of anastomisis (Fig. 8) in the event surgical intervention might again become necessary.

As an alternative method, restoration of continuity may be accomplished by gastroduodenostomy following the Von Harberer Finney technic. (Fig. 9.) Adequate mobilization of the duodenum and fashioning the stomach remnant in the form of tube as described in the foregoing will permit the resection of almost as much gastric tissue as is removed in the usual operation of subtotal gastrectomy. On theoretic grounds gastroduodenostomy should be preferable to gastrojejunostomy especially since the jejunal mucosa of the patients has already exhibited increased susceptibility to the direct action of gastric contents. This operation obviously has a limited application since it can be employed only in those cases of jejunal ulcer which follow gastro-enterostomy, for technical difficulties will preclude its use if subtotal gastrectomy has already been performed. Our own experience with gastroduodenostomy after excision of jejunal ulcer is limited to one case, but the necessity for performing a second operation for jejunal ulcer upon two patients during the past year has caused us to reconsider the advisability of adopting this method of gastro-intestinal anastomosis. Certainly it is a procedure that is preferable to resection of the ulcer and lysis of the gastrojejunostomy without gastrectomy, though the recent work of Dragstedt[9] indicates that in the future vagotomy plus restoration may be the operation of choice.

SUMMARY AND CONCLUSIONS

1. Jejunal ulcer is a more descriptive term than anastomotic or stomal ulcer, for ulceration occurring after gastrojejunal anastomosis.

2. All jejunal ulcers appear opposite the stoma or in the efferent loop.

3. Hemorrhage and perforation are common.

4. Diagnosis is based largely on clinical evidence of recurrence of ulcer symptoms after operation and confirmatory *x*-ray evidence is often wanting.

5. Resection of the involved segment of a jejunum with end-to-end anastomosis is a simpler and safer procedure than excision and plastic closure.

6. Subtotal gastric resection is clearly indicated. A method which limits peritoneal soiling is described.

7. Recurrence of jejunal ulcer in patients with ulcer diatheses occurs even after adequate gastric resection.

REFERENCES

1. LEWISOHN, RICHARD. The frequency of gastrojejunal ulcers. *Surg., Gynec. & Obst.*, 40: 70–76, 1925.

2. Lahey, Frank H. Diagnosis and management of gastrojejunal ulcer and gastrojejunocolic fistula. *Surg. Clin. North America*, 20: 767–780, 1940.
3. Marshall, S. F. and Devine, J. W., Jr. Gastrojejunal ulcer. *Surg. Clin. North America*, 21: 743–761, 1941.
4. Walters, Waltman and Clagett, O. T. Gastrojejunal ulcer. *Am. J. Surg.*, 46: 83–93, 1939.
5. Smith, L. A. and Rivers, A. B. Gastroileostomy and gastroileal ulcer. *Surg., Gynec. & Obst.*, 76: 110–114, 1943.
6. Bracci, U. Perforazione in peritoneo libero di ulcera peptica insorta dopo resozione. *Arch. ed atti d. Soc. ital. di chir.*, 44: 784–794, 1938.
7. Singer, H. A. and Meyer, K. A. Perforation of jejunal ulcer into free abdominal cavity. *Arch. Surg.*, 29: 248–263, 1934.
8. Warren, K. W. and Fallis, L. S. Perforation of postoperative jejunal ulcers. *Surgery*, 15: 569–573, 1944.
9. Dragstedt, Lester R. Vagotomy for gastroduodenal ulcer. *Ann. Surg.*, 122: 973–989, 1945.

Pyloric occlusion with secondary vomiting and dilatation of the stomach occurs either from cicatricial contraction or from the swelling and edema associated with an ulcer. Rare complications are the occlusion of the bile duct with stone formation and jaundice; and pancreatitis from invasion of the pancreas or obstruction of a pancreatic duct.

From "Principles and Practice of Surgery" by W. Wayne Babcock (Lea & Febiger).

CORRECTION OF THE CONGENITAL PROTRUDING EAR*

A NEW SURGICAL CONCEPT

ROBERT C. SEELEY, M.D.

NEW YORK, NEW YORK

MUCH has been written concerning the restoration of protruding ears in the past few years, particularly during the maze of progress of plastic surgery. Up to the present time, the most logical and practical correction has been advanced by Young,[12] of Rochester, New York.

Young's procedure may be adopted to most cases requiring correction particularly when the correction involves bringing the outer rim of the protruding ear closer to the head. While this procedure goes extensively further relative to the anatomical restoration of the ear, I believe that it does not go far enough and that correction, involving the conchoidal flare and protrusion of the lobule cannot be obviated with Young's procedure alone. It requires still further anatomical resection.

It has been my custom to pursue the following procedure for such cases: As near as possible first the abnormal ear is grasped with both hands and flexed toward the head so as to visualize or bring into effect the position that an antihelix would occupy. At the same time the delineation of the crura of the triangular fossae is emphasized. With the use of six hypodermic needles, 5/8 inch in length, one needle pierces the antihelix at the junction of the crura of the triangular fossa. A second and third needle pierce the outer third of each crus. Distally, a fourth needle pierces the continuation of the antihelix just medial to the antitragus. The fifth needle pierces the middle of the cavum conchae just on a level with the external auditory meatus. A sixth needle pierces the base of the intertragic notch. The most important part of this procedure is the proper placing of the needles at the junction of the forked arms. The exits of these needles on the posterior surface are connected with marking dye. The dye markings thus drawn present a distal Y bar and a superior Y bar joined at the base of their stems. The needles at this point may be withdrawn. This marking procedure will delineate the position of the incisions to be made on the posterior surface of the auricle.

The operative procedure is most satisfactorily carried out under procain nerve block with supplemental procain infiltration anesthesia. This procedure is adopted for the young as well as for the old. It is advisable to operate on children as early as eight years of age under local anesthesia. All nervousness and fear can be allayed with proper sedation and psychological management. The amount of anesthesia used can be reduced as little as 5 to 8 cc., provided the bore of the needle is sufficiently small enough, 27 or 30 gauge, and the distribution of the procain is carried out in the proper manner.

As soon as the incision is carried out according to the marking dye, one usually finds that the incisions are deep enough to make the same delineations on the perichondrium posteriorly. The perichondrium on the posterior portion of the auricular cartilage can be sacrificed and need not necessarily be elevated from the posterior surface of the auricular cartilage. To do so may fragment the cartilage and may cause unnecessary delay as well as loss of artistic excision.

Through the visible incised perichondrial markings the cartilage is further incised and from this point on the triangular flaps

*Presented at the Manhattan Eye, Ear and Throat Hospital, New York City, with case demonstration and motion picture, March 26, 1946.

of cartilage thus outlined are elevated from the pre-auricular perichondrial attachment. This is the most important part of the procedure. At this stage three triangular flaps exist, a superior, inferior and a conchoidal triangular flap with a very broad base. The superior triangular flap represents the cartilage outlining the triangular fossa. The inferior one represents the cartilage at the floor of the cavum conchae and the larger one represents the portion of the auricular cartilage which is continuous with the external canal proper. At this time the rim of the cartilage outlining the antihelix is elevated subperichondrially from the anterior perichondrial sheath. The next step in the procedure is to remove an arrowhead pattern segment of cartilage from each triangular cartilaginous flap. This arrowhead pattern segment is virtually a v-shaped section of cartilage, broadest at the apex and tapering to a point in each of its arms. This procedure is carried out for each triangular cartilaginous flap. The sections removed are resected according to judgment, viz., size of cartilage presented, the size of the original ear, and the correction desired. However, it is always advisable to err on the side of removing a segment slightly smaller than to remove too large a segment.

The arrowhead pattern is resected as follows: At a point approximately 2 to 3 mm. from the inferior apex point of the triangular cartilage, delineating the triangular fossa, an incision is made paralleling the upper arm of the triangular fossa and tapering gradually toward it until it meets the first incision at a distance just below the scapha. Starting again at the apex, a similar incision is carried along the inferior arm toward the scapha. The result of this procedure is to remove an arrowhead-shaped section of cartilage surrounding the triangular fossa. This permits marked freedom of flexibility of the balance of the auricular cartilage about the triangular fossa area. The triangular fossa section of the cartilage becomes more prominent as the skin and perichondrium are draped over the new formed ridges. Similar pattern resections are performed on each of the other two triangular cartilage flaps.

If, after the three sections have been removed the apparent reduction in the auricle to the side of the head is insufficient, the procedure is duplicated by resecting a second section of cartilage from the particular triangular flap which may cause the residual protrusion. In any case the pattern is the same. The procedure is the same. Herein lies the value of this particular surgical procedure for should multiple excisions be necessary the remaining cartilage flaps will fall into a normal anatomical relationship.

It is to be noted here that the section removed from the conchoidal cartilage should have a somewhat curved surface to fit in well with the antihelicine curve and the incision originally made. However, this section, on removal, still retains its arrowhead-shaped appearance.

Subsequent to the removal of the first section of each triangular cartilaginous flap or to the removal of the second section of each triangular flap, the helix and soft parts of the ear are allowed to fall back over the resected cartilaginous surface. A study of the anterior auricular surface is made for anatomical configuration. If the contour is normal, it is proper to proceed with closure of the posterior wound. However, in extremely large ears, as in the case here presented, there will be additional buckling, bowing or recoiling of the cartilage in unexpected places particularly about the bordering rim. This buckling can be obviated not by cutting through the helix rim, as many surgeons have outlined, but by preservation of the rim. In its stead I remove a small triangular wedge whose base abuts the extreme end of each incision outlining the arrowhead pattern. These segments usually vary from 1 to 2 mm. at their base and 2 to 4 mm. at their sides.

This triangular section must be gauged according to the operator and judged according to the size of the cartilage and

ear one is dealing with. It will be found that when this additional step is utilized, the ear will fall back toward the head without tension, mobilization of the soft tissue will be completely obtained and resection of the cartilage, will be properly and anatomically done. One could interpret this procedure as a preservation of anatomical contours accomplished by means of anatomical resections.

It is to be noted that from the original incisions in the skin and subcutaneous tissues similar triangular sections of soft tissue are presented overlying the resected cartilages. The pattern resection applied to the cartilage flaps is now applied to the soft tissue flaps. These latter resections result in a reduction of soft tissue of the postauricular skin and subcutaneous tissue. This procedure facilitates the accomplishment of anatomical contours by obviating redundant soft tissue which would unnecessarily interpose between the cartilaginous incisions.

The procedure subsequent to the excision of the postauricular soft tissue is to suture the wound edges of soft tissue and perichondrium with interrupted sutures of c silk mattress and single sutures as desired. When the procedure is completed posteriorly the closed incision resembles the original incision except that it is shorter in all its directions due to the resection. If at this stage, there is an anterior or vertical protrusion of the lobule of the ear to the head, the procedure is to resect a section of skin and subcutaneous tissue in the posterior surface, triangular in shape, the base coinciding with the base of the inferior triangle, the apex directed inferiorly. When the included soft tissue is removed, the wound edges are approximated in a vertical direction. This procedure then will be a complete correction for protrusion of the helix, the conchoidal cartilage and the lobule, anyone of which, existing alone, may be corrected by adopting the above procedure to the particular abnormality; should all exist at the same time, all the above steps must be accomplished at one sitting.

As a final step in the procedure and to preserve anatomical contour to prevent hematoma formation and cauliflower ears and to facilitate union as well as to preserve the plastic correction obtained at operation, it is advisable to utilize the Kitlowski procedure of using mattress sutures of silk or No. 35 steel alloy wire or tantalum wire .0003 over vaselinized gauze. These sutures are carried through the skin and cartilage of the scapha, thence through the cartilage and skin of the concha, thence from the skin and cartilage of the concha through the cartilage and skin of the scapha. Vaseline gauze is interposed between the loops and the sutures are tied. This permits an abutment of the conchoidal and scapha cartilages so as to preserve the new antihelix. In this particular procedure, usually such sutures are necessary but particular note must be made in the application of the superior suture which traverses the skin and subcutaneous tissues and cartilage of the scapha and concha cartilage and skin and then on return traverses the skin and cartilage of the concha, then through the cartilage and skin of the triangular fossa on the medial limbus coming out over the triangular fossa and then through the skin and cartilage of the posterior limbus of the triangular fossa through the cartilage of the scapha and thence through the skin. A small plug of vaseline gauze is inserted under the loop in the triangular fossa to preserve contour in the scapha and triangular fossa. These sutures are allowed to remain in place for two weeks before any dressing is done. At the end of that time, the procedure is to remove the mattress sutures and vaseline gauze as well as postauricular sutures. A mastoid dressing is reapplied for a period of another week at the end of which time the patient is allowed to go about without a dressing.

It is to be noted from the pictures presented that the reconstructed ears present the anatomical contours of concha, antihelix and helix and present no evidence of a hinged back ear which is typical in cases in which the helix has been split

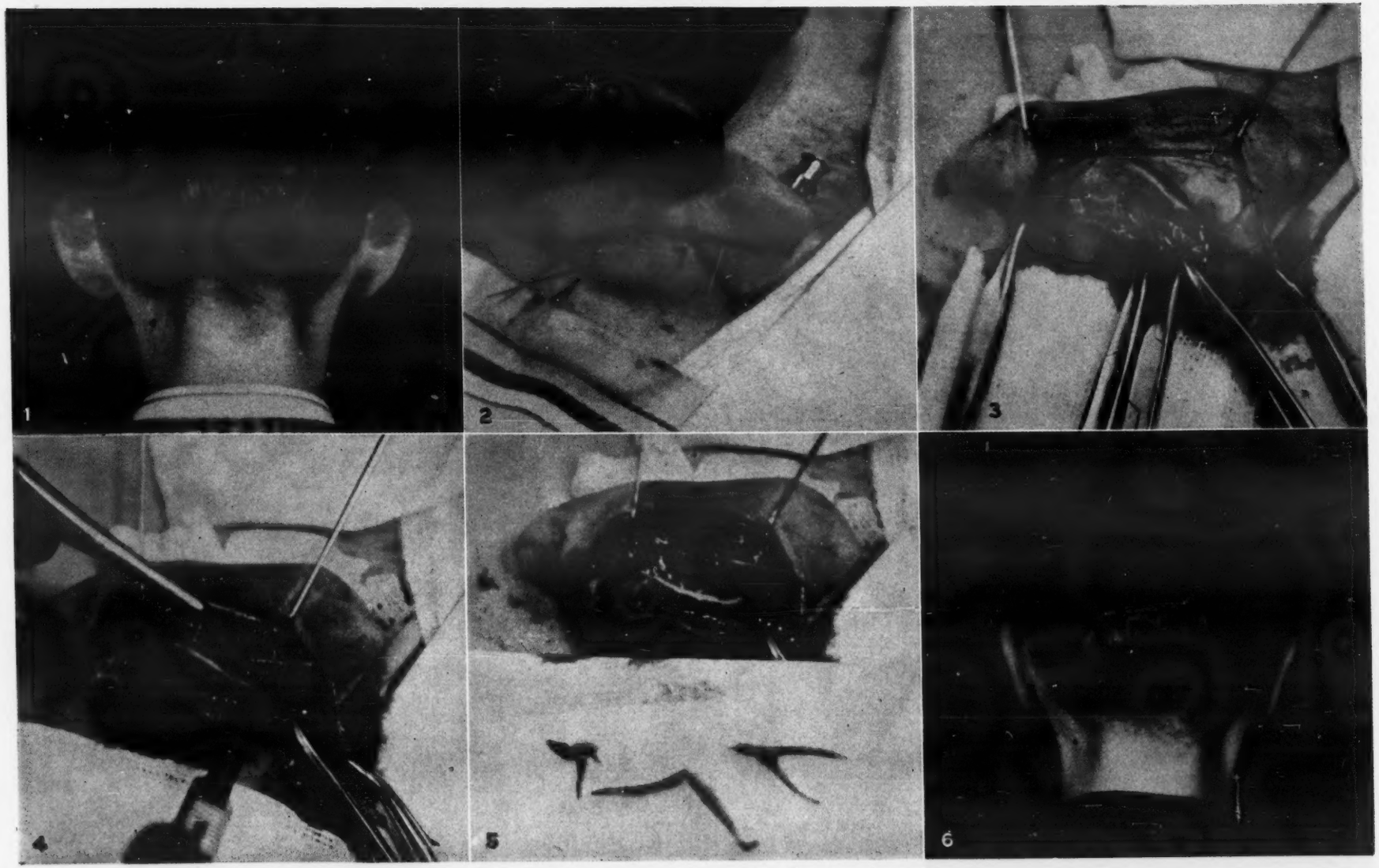

FIG. 1. Preoperative view to show wide auriculocephalic angle.
FIG. 2. The marking dye demonstrates the direction of external incisions on posterior surface of the ear.
FIG. 3. Demonstrating the incisions made through the cartilage which follow the direction of the original incisions.
FIG. 4. Demonstrating the arrowhead cartilaginous resection in the superior triangular cartilaginous flap.
FIG. 5. Demonstrating arrowhead patterns from the superior, middle and inferior triangular cartilaginous flaps.
FIG. 6. Postoperative view to show improved condition.

to accomplish the result. The above procedure, does not present the hideous clam shell conchoidal flare and anterior concave flaring of superior and inferior poles of the auricle characteristic of reconstruction procedures in which equal segments of skin and subcutaneous tissue are removed from the postauricular and mastoid surface with coaptation of the wound edges.

In most cases of protruding ears, the flare deformity extends inferiorly as well as superiorly and the lobule of the ear is protruding and there is a marked protrusion of the conchoidal portion inferiorly from the antitragohelicine fissure to the isthmus of the auricular cartilage.

When the correction has been made according to all other procedures, the primary consequence is flexion of the helix toward the head. In the lower two-thirds of the pinna proper thus far no attempt has been made to correct the shell-like flare of a marked conchoidal protrusion inferiorly. Likewise, the previous corrections for protruding ears do not permit the formation of a well developed triangular fossa delineated by upper and lower arm extensions.

SUMMARY

1. No where in the literature can one find a plan of reconstruction of the abnormally protruding ear which can be adopted universally.

2. The procedure here outlined is simple. It can be followed step by step and at no time leaves the surgeon in a quandary as to the site of cartilaginous excision.

3. This procedure can and should, if possible, be carried out under local anesthesia. While it is simple, it requires thoroughness and patience.

4. This procedure should be easy of accomplishment by any competent plastic surgeon.

5. This procedure is anatomical and when properly done results in the maximum anatomical correction.

6. General anesthesia may be administered but is not desirable owing to the difficulty presented with anesthetist and assistants about the head. The surgeon should sit during the operation.

7. This procedure, owing to the complete mobilization of cartilage, soft tissue and perichondrium and the redraping of soft tissue over anatomical contours is not followed by the complaint of pain on the part of the patient.

8. This procedure permits not only the correction of protruding ears but a reduction in the size of abnormally large ears.

9. This procedure can be adapted to minimal or maximum corrections.

10. This procedure does not interfere with the soft tissues over the mastoid process, and, therefore, would not be a source of disturbance to the mostoid surgeon.

11. The author has followed this procedure during three years, in many cases. The illustrations demonstrate its simplicity.

REFERENCES

1. Baxter, H. Plastic correction of protruding ears in children. *Canad. M. A. J.*, 45: 217–220. 1941.
2. Dairs, J. S. and Kitlowski, E. A. Abnormal prominence—method of readjustment. *Surgery*, 2: 835–848, 1938.
3. Fernandez, L. L. Protruding ears—technical detail of surgical correction. *Semona med.*, 2: 89–90, 1940.
4. Foucar, H. O. Congenital anomalies with surgical therapy of prominent ear. *Canad. M. A. J.*, 43: 26–27, 1940.
5. Graham, H. B. Plastic surgery. *West. J. Surg.*, 44: 478–489, 1936.
6. Greeley, P. W. Reconstruction. Conservation of avulsed portion. *U. S. Navy Med. Bull.*, 42: 1323–1325, 1944.
7. Ombredonne, M. Protruding ears and their surgical correction. *Semaine d'hôp. de Paris*, 15: 404–411, 1939.
8. Neu, G. B. and Erich, J. B. Protruding ears and their surgical correction. *Am. J. Surg.* 48: 385–390, 1940.
9. Padgett, E. C. Total reconstruction of auricle. *Surg., Gynec. & Obst.*, 67: 761–768, 1938.
10. Pedermonte, P. V. Protruding ear: pyschological effects. Morphological class. and surg. therapy. *Au. d'atemeo. clin. quir.*, 7: 73–87, 1941.
11. Posse, R. Palacio. New surgical therapy of protruding ears without resection of cartilage. *Arq. de cir. clin. exper.*, 6: 489–492, 1942.
12. Young, Forrest. The correction of abnormally prominent ears. *Surg., Gynec. & Obst.*, vol. 78, May, 1944.

COMFORT IN CASES OF ANORECTAL SURGERY

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IT is the purpose of this paper to describe certain observations and procedures relative to the comfort of the patient, whenever anorectal surgery is required.

An individual, affected with a painful anorectal disease is in need of sympathy. Immediately, at the occasion of his first visit he should be given the assurance that the cause of his distress can be determined painlessly and with a minimum of discomfort. Thrombotic hemorrhoids, for instance, are easily seen. A fissure in ano can be made visible upon retracting the buttocks while the patient bears down. An abscess is localized by superficial or deep palpation alongside the external sphincter. Only occasionally will it be found necessary to insert the finger in order to ascertain the presence of a submucous abscess or one situated above the levator ani. When pain in the anorectal line is due to malignancy or fecal impaction, digital examination becomes necessary. In cases of painful lesions proctoscopy may be deferred except in those instances in which malignancy is suspected and the diagnosis not definite. Further examination can be carried out under topical anesthesia, using a 4 per cent solution of metycaine, or at time of surgery.

The patient should be protected from fear and from pain during his preoperative stay at the hospital. The night preceding operation nembutal is given to induce sleep. Whenever pain in the anal outlet is present, 2 cc. demerol is administered hypodermically, one hour before the cleaning enemas. Nembutal, morphine or scopolamine—the dose adjusted to age and weight of the patient—is given as a standard procedure to induce drowsiness or sleep prior to surgery.

Caudal, transsacral or local anesthesia is used instead of spinal anesthesia for anorectal surgery, in order to prevent the incidence of postoperative headaches. At the conclusion of the operation, oil anesthesia—preferably zylcaine—is injected beneath the cut surfaces, except in acutely infected areas. In carrying out this procedure, care is taken to avoid the sphincters; thus in case of sensitivity to the oil anesthetic the ensuing induration will not extend into the anal canal and form a fistula. A dose of 7 to 10 cc. of oil will induce only partial prolonged anesthesia. However, it is inadvisable to increase this amount, as larger doses of oil anesthesia occasionally cause incontinence. Such a loss of control will first become evident when on the third postoperative day an enema is given, and may occasionally persist over a period of two months. Every effort should be made to avoid the occurrence of incontinence, as such an experience may produce mental shock in sensitive patients. Partial prolonged anesthesia, which does not cause incontinence, allows for a certain amount of pain which is controlled by opiates, demerol and aminopyrine.

Postoperative comfort for the patient is dependent upon adherence to detailed instructions. This is best accomplished by printed orders. It should be part of the routine procedure to individualize and sign such orders at the time of completion and signing of the patient's history and physical examination records. The standard orders which have been compiled for this purpose are simple, easily executed and make it incumbent upon the nurse to keep the patient comfortable These orders are printed on four separate pages of hospital chart size; the last page contains

home directions and is intended to be given to the patient upon discharge.

HOSPITAL TREATMENT RECORD (Page One)

Name..... Adm. No.....

Patient Entering Hospital for Anorectal Surgery

Anesthesia will be caudal or local.

Light supper.

Prepare for surgery by

Tap water enemas until returns clear.

No local preparation.

Sodium pentobarbital gr. 1.5 at bedtime. Repeat if necessary for sleep. For painful anal outlet precede enemas by demerol 2 cc. Use small colon tube or catheter.

Day of Operation

Before Surgery:

No breakfast for surgery before 11 A.M. Otherwise light breakfast.

Sodium pentobarbital grs. 4.5, one-and-a-half hour before surgery.

Morphine sulfate gr. ¼, scopolamine gr. 1/150, one-half hour before surgery.

After Surgery:

Morphine sulfate gr. ¼ before anesthesia is completely worn off.

Repeat every one to four hours as needed to keep patient comfortable.

Catheterize in 8 hours or before if distressed. Instill 30 cc. of ½ per cent mercurochrome solution. Then catheterize every 8 hours p.r.n.

May sit up on side of bed to void. Non residue diet. Patient should have 2 glasses of water and 2 glasses of fruit juices if too sleepy to eat.

For emesis, substitute dilaudid gr. 1/16 for morphine.

Adjust and replace soiled dressings at bedtime.

Signature:

HOSPITAL TREATMENT RECORD (Page Two)

Name..... Adm. No.....

First Postoperative Day

Demerol 50 mg. 2 tabs. by mouth every six hours. Use demerol 2 cc. subcutaneous if nauseated.

Hot compresses or infra red lamp t.i.d.

Mercurochrome 2 per cent and antipyrexol to wounds. Leave at bedside with cotton applicator.

Non residue diet.

Petrogalar plain, 1 tablespoon after meals.

Ambulatory.

Sodium pentobarbital gr. 1.5 p.r.n. for sleep.

Aminopyrine gr. 5, tabs. 6 at bedside. Directions: 2 tabs. every one hour if necessary for comfort.

Second Postoperative Day

Demerol 50 mg. 2 tabs by mouth every six hours.

Hot compresses or infra red lamp t.i.d.

Mercurochrome 2 per cent and antipyrexol to wounds.

Regular diet. Petrogalar plain, one teaspoon after meals.

Ambulatory.

Sodium pentobarbital gr. 1.5 p.r.n. for sleep.

Aminopyrine gr. 5, tabs. 6 at bedside. Directions: 2 tabs. every one hour if necessary for comfort.

Signature:

HOSPITAL TREATMENT RECORD (Page Three)

Name..... Adm. No.....

Third Postoperative Day

Demerol 2 cc. Remove rubber wick. Follow in one hour with enema, two teaspoons full of hydrogen peroxide to one quart of tap water through a small colon tube or large catheter.

Ambulatory.

Regular diet.

Sitz bath or heat to anal region after enema.

Mercurochrome 2 per cent and antipyrexol to wounds.

Demerol 50 mg. 2 tabs. every six hours. Space 4 hours after demerol hypo. Petrogalar plain, one teaspoon full after meals.

Sodium pentobarbital gr. 1.5 p.r.n. for sleep.

Aminopyrine gr. 5, tabs. 6 at bedside. Directions: 2 tabs. every one hour as needed for comfort.

Fourth Postoperative Day and Daily

Ambulatory.

Regular diet.

Petrogalar plain, one teaspoon full after meals.

Hot sitz bath or other heat p.r.n.

Demerol one tablet every 6 hours.

Mercurochrome 2 per cent and antipyrexol to wounds after bowel movement.

Tap water enema one pint, p.r.n.

Sodium pentobarbital gr. 1.5 p.r.n. for sleep.

Aminopyrine gr. 5, tabs. 6 at bedside. Direc-

tions: 2 tabs. every one hour as needed for comfort.
May go home fifth postoperative day or any day following.

Signature:

TO TAKE HOME FROM THE HOSPITAL (Page Four)

Antipyrexol. 2 per cent mercurochrome. Cotton. Applicators (can make own applicators at home with tooth-pick and cotton).
Petrogalar plain. Aminopyrine gr. 5, 20 tabs.
On arising take one-half teaspoon full of table salt in glass of cold water, followed by another glass of water.
Two tabs. Aminopyrine, one-half to one hour before breakfast.
Bathroom after breakfast; if no bowel movement, may take teacup of tap water enema. Aminopyrine 2 tabs. one hour before bowel movement will prevent pain. May use glycerine suppository instead of enema.
After bowel movement take hot sitzbath or hot compresses.
Paint wounds with 2 per cent mercurochrome and apply ointment on a swab.

Take one tablet aminopyrine every 4 hours or oftener as needed to keep comfortable.
Apply hot compresses to anal region as needed for comfort.
Petrogalar plain, one teaspoon full after meals to keep movements soft; gradually lessen dose to stop in 3 weeks from surgery.
Report to office once weekly or oftener.

Signature:

An analysis of 200 hospitalized anorectal surgical cases from the year 1945, in which these routine orders were followed, reveals possible hazards and points the way to further improvement.

Approximately 90 per cent of the patients had a comfortable postoperative course, while the remaining 10 per cent suffered a certain amount of pain. The chief cause of discomfort in these cases was due to the inability to give the drugs used to control pain, because of drug idiosyncrasy of the patient. Rarely did the nurse show insufficient judgment as to the time of giving opiates. Occasionally a patient will be supersensitive to pain.

Of the 200 cases, 133 received caudal or transsacral, while fifty-six received local anesthesia. Spinal anesthesia was avoided, as previous experience with that method in clinic patients led to headaches in a considerable number of cases. Jennings and Karabin[3] report an incidence of cephalalgia in 30.6 per cent, mostly after anorectal operations.

A series of cases receiving caudal or local anesthesia will rarely be without complications. Surgical anesthesia of the buttocks and the perineum developed within ten minutes after injection of 6 cc. of a 2 per cent intracain solution in one patient to whom a caudal anesthetic was being administered. Aspiration had not obtained spinal fluid. It was assumed that the needle must have entered the subarachnoid space in order to have produced anesthesia with such a small volume of the anesthetic agent. Two patients suffered convulsions, and one twitching while the caudal anesthetic was administered, and these symptoms were considered to be intravenous reactions to the anesthetic. Severe backache occurred in two patients after the anesthetic solution had been injected outside the sacral canal. Complications of caudal anesthesia and their management have been described by Gready.[1] One patient developed a deep anal and perianal infection following local anesthesia. Contamination can be prevented by placing an aspiration needle into the anesthetic solution, refilling the syringe through the needle rather than by dipping the tip of the syringe into the solution.

The patients were allowed out of bed as soon as awake from the effects of premedication. The postoperative course was disturbed most frequently by nausea and vomiting. In 21 per cent of cases in which this occurred during the first twenty-four hours, it was considered due chiefly to morphine. Demerol caused nausea and

vomiting in 8 per cent of cases, 3.5 per cent of which were after hypodermic administration only. It should be mentioned that the vomiting caused by demerol is not as intense or as prolonged as that resulting from morphine. The substitution of demerol for morphine in premedication seems indicated, as reported by Rovenstine and Batterman.[4]

Catheterization was necessary in 45 per cent of the cases, 5.5 per cent of which required a second catheterization. At each catheterization 30 cc. of an 0.5 per cent aqueous solution of mercurochrome was instilled in order to promote bladder contraction, as reported by Helfert and Granet.[2] It remains an open question whether it is preferable to catheterize 100 per cent in surgery, instilling this solution immediately to exclude the necessity for further catheterization; or whether it might be better to wait and instill the solution in the 45 per cent of cases which require catheterization subsequent to surgery.

After leaving the hospital, the 200 patients presented in this series were treated in the office at weekly intervals, until healing occurred and function became normal.

SUMMARY

The comfort of the patient suffering from an anorectal disease can be safeguarded through a sequence of carefully chosen measures:

1. Examination should be made without causing distress. Painful lesions are localized from the anorectal line downward, and can be diagnosed by vision and gentle palpation.

2. Premedication protects the patient from the pain of enemas and the fear of surgery.

3. By substituting caudal, transsacral or local anesthesia for spinal anesthesia, headaches can be prevented. Oil anesthesia, chiefly zylcaine, in 7 to 10 cc. dosage underlaid beneath the cut surface produces partial prolonged anesthesia. Complete prolonged anesthesia is not desired as it may lead to transient incontinence.

4. Postoperative comfort is best assured by individualized standard routine orders, signed together with the history and physical examination records. Text of routine orders is presented.

Analysis of 200 anorectal surgical cases, as to complications and results, points the way to caution and improved procedure.

REFERENCES

1. Gready, T. G., Jr. Some complications of caudal anesthesia and their management. *J. A. M. A.*, 123: 671, 1943.
2. Helfert, I. and Granet, E. Prevention of acute urinary retention following anorectal and perineal surgical procedures. *Am. J. Surg.*, 53: 129, 1941.
3. Jennings, W. K. and Karabin, J. E. Incidence of headache, nausea and vomiting following spinal anesthesia. *Am. J. Surg.*, 46: 317, 1939.
4. Rovenstine, E. A. and Batterman, R. C. The utility of demerol as a substitute for the opiates in preanesthetic medication. *Anesthesiology*, 4: 126, 1943.

SPONDYLOLYSIS AND ITS RELATION TO SPONDYLOLISTHESIS*

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SPONDYLOLYSIS literally means dissolution of all or part of a vertebra. Through common usage it has become synonymous with defects of the neural arch. It has been shown that the most important arch defects are those of the isthmus region, [1,2] and therefore it is to these defects that the term spondylolysis is applied in this paper.

Spondylolisthesis is a well recognized clinical entity.[3] The frequent coexistence of spondylolisthesis in spondylolysis has shown the need for an evaluation of this relationship from a roentgenological and clinical standpoint.

The diagnosis of spondylolysis with or without spondylolisthesis is established by adequate *x*-ray studies. An understanding of the gross anatomy of the lower lumbar region is required for proper interpretation of the roentgenograms. Routinely these include an anteroposterior projection (Fig. 1), a lateral projection (Fig. 2) and frequently a spot lateral projection of the lumbosacral joint. The anatomical structures revealed are indicated by corresponding diagrams.

The anteroposterior view (Fig. 1) indicates the number of lumbar vertebrae, and outlines the bodies and transverse processes, the depth of the upper lumbar intervertebral spaces and the alignment of the vertebral column. Due to angulation produced by the lumbosacral curvature and other physical factors, the presacral vertebra is poorly delineated and there is imperfect definition of the articular processes, the apophyseal joints and the interarticular or isthmus segments.

From the diagram (Fig. 4) it can be seen that the lateral view reliably presents the outline of each vertebral body, the depth of the intervertebral and lumbosacral spaces, the anteroposterior alignment of the vertebrae and the configuration of the spinous processes. The usefulness of the lateral view is limited by two features: (1) It superimposes the images of each half of the neural arch so that the lamina, articular processes, apophyseal joint and isthmus of the right side cannot be distinguished from the left, and (2) the apophyseal joint which lies at an angle ranging from 35 to 50 degrees anterior to the sagittal plane is not visualized nor are its components.

Because of these features, specific roentgen information about each half of the neural arch, particularly the pars interarticularis, can only be obtained by rotating the contralateral side anteriorly away from the cassette with the subject in the supine position. Thus the plane of the apophyseal joint in question is made to coincide with the tube-target beam and the corresponding articular processes, pars interarticularis and lamina for that half or side of the neural arch are clearly revealed. This is the essence of the oblique projection (Fig. 5) and the graphic representation (Fig. 6) confirms its primary importance in disclosing lesions of the isthmus and neighboring structures.

Spondylolysis and spondylolisthesis, when seen roentgenographically, affect the last or presacral lumbar vertebra almost exclusively. The presence and degree of displacement are determined from the lateral views using the criteria of Ferguson[4] although a recently described method is also of merit.[5] The lateral view reveals isthmus defects but does not dis-

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tinguish between unilateral or bilateral defects, nor does it indicate which side is involved. This point is illustrated in Figure 7.

the neural arch which connects the inferior articular process with the pedicle and the lamina. It is smooth in outline, usually bilateral and varies in width with the de-

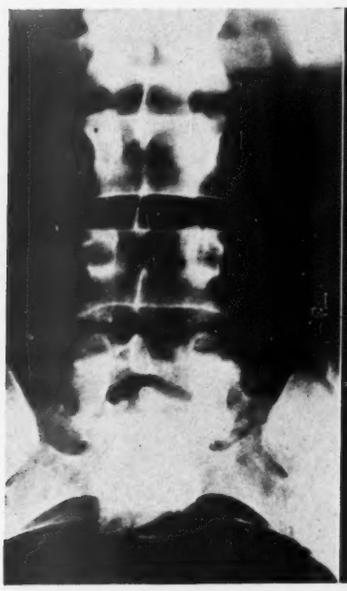

Fig. 1. Normal anteroposterior film.

Fig. 2. Normal lateral film.

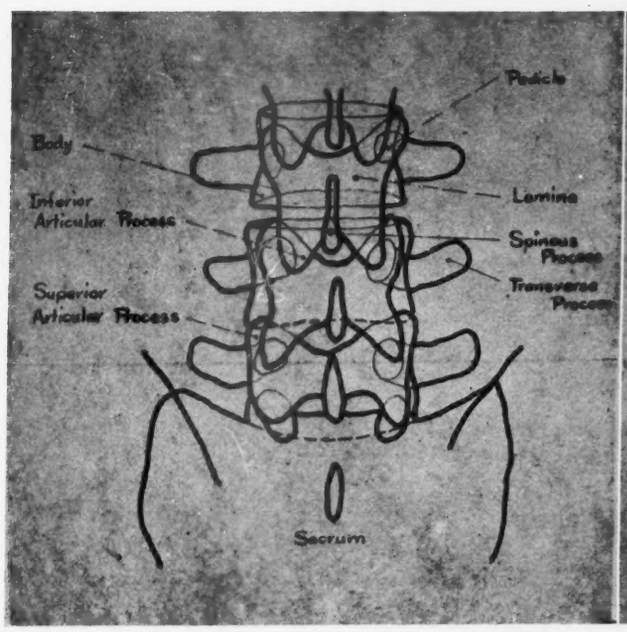

Fig. 3. Diagram of anteroposterior film.

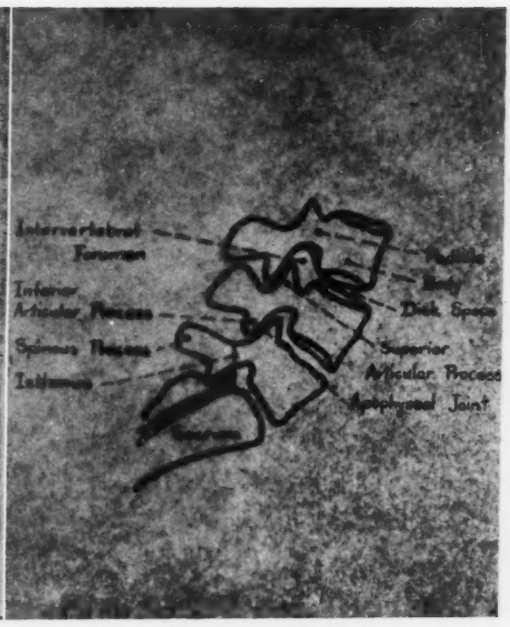

Fig. 4. Diagram of lateral film.

The lateral projection also indicates alterations in the disks, the intervertebral spaces, the intervertebral foramina and the vertebral bodies.

The defect of spondylolysis as seen in the oblique view is a gap in that segment of

gree of spondylolisthesis. Its presence may be suspected by a posterior indentation of Morton's S-shaped line[6] indicating recession of that apophysis continuous with the defective (shortened) lamina. Figure 8 illustrates the defect of spondylolysis.

Frequently, there are associated anomalies and abnormalities of the neural arch such as spina bifida occulta, or varying sory ossicles of the inferior articular processes. The former condition is seen as an irregular defect with sclerotic mar-

FIG. 5. Normal oblique (left) film.

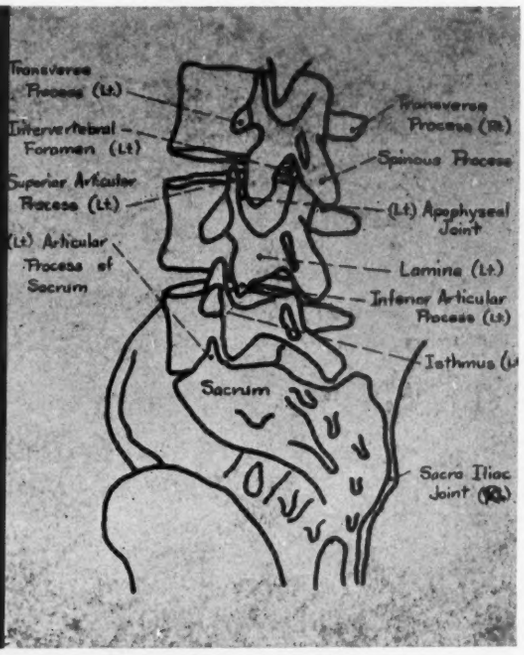

FIG. 6. Diagram of oblique film.

FIG. 7. Lateral film showing isthmus defect.

FIG. 8. Oblique film showing isthmus defect.

degrees of maldevelopment of the lamina and articular processes.

The defect must be distinguished from fracture of the isthmus and from acces- gins, usually producing callus and almost always unilateral. The latter condition is bilateral and seen as a small bone having a smooth outline and a well defined cortex,

located beneath the tip of each inferior articular process.

While a unilateral or bilateral defect may occur with or without slipping of a vertebra, in no instance in this series did spondylolisthesis occur without a defect of the isthmus whether unilateral or bilateral. The presence of spondylolisthesis is therefore believed to be prima facie evidence of spondylolysis.

It must be borne in mind that many conditions may produce symptoms similar to those of spondylolysis and spondylolisthesis with roentgen findings which are quite different. The more important ones of this nature are: subluxation of the apophyses, arthritis of the apophyses, and various forms of disk disorders. Furthermore, similar clinical findings are produced by a host of lesions which have no demonstrable *x*-ray changes. As a last caution one must avoid "overreading" films and subject all *x*-ray findings to a rigid scrutiny lest pathologic significance be ascribed to a harmless variation. This admonition is particularly apt in the lumbosacral region where the normal appearance is of such wide variability.

As has been stated it is believed that spondylolisthesis cannot occur without a defect in the neural arch of the displaced vertebra. The location, nature and mechanism of production of this defect are controversial, but the most widely accepted explanation is that the isthmus is the site of a hidden congenital or developmental defect.[1,2,7,8] This when subjected to trauma becomes manifest and may or may not be followed by spondylolisthesis. In this study of sixty cases of spondylolysis, conducted over a nine-month period, the onset of symptoms was preceded in all by some form of trauma. Commonly, the injury was apparently trivial but in the presence of the hidden defect constituted the "straw that broke the camel's back."

Spondylolysis with or without spondylolisthesis is more prevalent than has been heretofore realized. Thus, thirty-nine cases were found in 250 examinations done specifically for low back complaints, while the remaining twenty-one cases were incidental findings in 1,000 routine lumbosacral roentgen studies.

Table I

		Cases of Spondylolysis
Routine low back exams.	1,000	21
Specific low back exams.	250	39
Totals.	1,250	60

The overall incidence, sixty cases of spondylolysis in 1,250 examinations, compares with the results of other investigators. The majority of cases of spondylolysis occurred in younger individuals, approximately three-fourths of whom were recently discharged service men in the third or fourth decade. Incidence relative to sex is lacking, males constituting 98 per cent of the cases.

A typical history included "back trouble" existing for some time before induction. This complaint had developed following severe trauma such as a fall or a severe wrenching strain while engaged in various athletic pursuits. Occasionally, the symptoms were mild and of gradual onset. The precipitation of acute incapacitating symptoms was almost invariably ascribed to the rigors of military life such as: calisthenics, marching and jumping with full pack, obstacle courses and infiltration tactics.

Table II

No displacement	5
First degree displacement	26
Second degree displacement	7
Third degree displacement	1
Fourth degree displacement	0
Totals	39

The objective findings were meager: limitation of motion, external lumbar deformity, and local tenderness being most common. Extension of the spine was

frequently limited and flexion hesitantly performed. Visible external deformity required severe displacement which was uncommon.

Tenderness over the spinous process of the affected presacral vertebra was the most constant finding. The paucity of physical findings cast some doubt on the significance of the symptoms, in some instances leading to the erroneous army diagnosis of psychneurosis with subsequent discharge, and in other instances leading to the suspicion of malingering. Rarer still were neurological findings. Lasegue's test was occasionally mildly positive, but was only once associated with additional evidence of sciatic nerve irritation. Findings indicative of disk herniation or nerve root compression were lacking, suggesting another mechanism for the production of the pain in spondylolisthesis.

A breakdown of 100 consecutive cases of low back pain revealed that only five carried an army discharge diagnosis of herniated intervertebral disk. In none of these could the diagnosis be confirmed, while only one of the remaining ninety-five cases was given a presumptive diagnosis of disk herniation.

TABLE III

Major Army Discharge Diagnosis	No.	Cases of Spondylolysis
Low back injury (incl. lumbosacral or sacro-iliac sprain)	25	2
Arthritis, lumbar spine	25	1
Low back pain (incl. lumbago, etc.)	16	2
Spondylolisthesis	10	10
Sacro-iliac disease	8	0
Anomalies of lower spine	5	1
Sciatica	5	0
Herniated intervertebral disk	5	1
Psychoneurosis	1	1
Totals	100	18

In addition to the ten cases of spondylolisthesis wherein the army diagnosis was confirmed, eight additional cases were discovered, five having been previously given a primary or secondary diagnosis of psychoneurosis.

A review of the *x*-rays in these cases of spondylolisthesis emphasized several facts and posed a few problems. The single diagnostic measure of primary importance is the roentgenogram, particularly the oblique projection. The 35 degree cephalad cone-tilt[9] used in a few cases failed to supply definitive evidence.

Since a loose segment of neural arch is essential for the production of vertebral displacement,[10] unilateral isthmus defects cannot mechanically produce spondylolisthesis unless associated with another laminal defect. A few cases of spondylolisthesis, however, were seen in which only a single isthmus defect was demonstrable, but in none of these was the contralateral isthmus entirely normal roentgenographically. In these cases it is believed that oblique projections taken in varying degrees of obliquity would disclose a defect of the contralateral isthmus.

A confirmatory diagnostic finding is evident at the operating table. In eight cases of spondylolysis with spondylolisthesis, direct manipulation of the exposed spinous process of the affected vertebra demonstrated abnormal mobility. Two of these cases presented only unilateral defects on the roentgenograms.

The treatment of spondylolysis depends on the nature of the defect and the absence or presence of vertebral displacement. These three factors served to classify the cases into three groups: (1) Unequivocal unilateral isthmus defects. These cases require no treatment. (2) Bilateral isthmus defects without vertebral displacement. This group includes those cases with unilateral isthmus defects associated with an additional laminal defect. A prosthetic brace, preferably of the Taylor variety, is recommended for these patients, and they are cautioned to avoid strenuous physical exertion. (3) Bilateral defects with vertebral displacement. These patients are offered the choice of a brace or

surgery unless advanced age or a serious coexisting disease contraindicate surgery.

Only eight patients have been subjected to surgery making any conclusions or detailed analyses premature. The clothespin type[11] of spine fusion using an autogenous tibial graft is considered the procedure of choice. All six patients who underwent the fusion operation have thus far not experienced any return of symptoms.

SUMMARY

An evaluation of the relationship between spondylolysis and spondylolisthesis has been made from a roentgenological and clinical standpoint. The clinical material consisted of sixty cases observed in 1,250 examinations.

CONCLUSIONS

1. Spondylolisthesis predicates spondylolysis.

2. The incidence of spondylolysis is greater than has been realized, and it should be sought for in all cases of low back pain.

3. Roentgenograms, particularly the oblique projection, are diagnostic.

4. Trauma may frequently render an asymptomatic spondylolysis symptomatic.

5. The treatment is largely conservative, but in selected cases spine fusion is warranted.

REFERENCES

1. Chandler, F. A. Lesions of the "isthmus" (pars interarticularis) of the laminae of the lower lumbar vertebrae and their relation to spondylolisthesis. *Surg., Gynec. & Obst.*, 53: 273–306, 1931.
2. Willis, T. A. Separate neural arch. *J. Bone & Joint Surg.*, 12: 709–721, 1931.
3. Turner, Henry and Tchirkin, N. Spondylolisthesis. *J. Bone & Joint Surg.*, 7: 763–786, 1925.
4. Ferguson, Albert B. The extremities and spine. *Ann. Roentgenol.*, 17: 371, 1939.
5. Meschan, I. Spondylolisthesis. *Am. J. Roentgenol.*, 53: 230–243, 1945.
6. Morton, S. A. The value of the oblique view in the radiographic examination of the lumbar spine. *Radiology*, 29: 568–573, 1937.
7. Scott, Wendell, G. Low back pain resulting from arthritis and subluxation of the apophyseal joints and fractures of the articular facets of the lumbar spine. *Am. J. Roentgenol.*, 48: 491–509, 1942.
8. Hitchcock, H. H. Spondylolisthesis; observations on its development, progression and genesis. *J. Bone & Joint Surg.*, 22: 1–16, 1940.
9. Caldwell, G. A. Spondylolisthesis; analysis of 59 consecutive cases. *Ann. Surg.*, 119: 485–497, 1944.
10. Willis, T. A. Structure and development of the spine. *J. A. M. A.*, 125: 407–412, 1944.
11. Bosworth, David M. Clothespin or inclusion graft for spondylolisthesis or laminal defects of the lumbar spine. *Surg., Gynec. & Obst.*, 75: 593–598, 1942.

DUODENAL INJURIES

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INJURIES to the duodenum occur infrequently, and it is a distinct rarity that the duodenum alone is damaged. In World War I there were reported ten instances[1] of duodenal injury comprising 6 per cent of all small bowel involvement. The mortality for these ten cases was 80 per cent. The statement is made in the general surgical section of the "Medical History of World War I," that multiple lesions are usually encountered in duodenal injury, the average expected is four to six.

Jarvis,[2] in his analysis of the abdominal wounds handled by this group in 1943, reports nine cases of duodenal injury with seven deaths. In two cases, the duodenal lesion was missed at operation and in one of these, the missed perforation was the cause of death. These nine cases were marked by the multiplicity of organs involved. In three of the seven deaths reported, the pancreas was involved, in one the vena cava, and in another, the superior mesenteric artery.

For the year 1944 and the active part of 1945, there have been 118 instances of duodenal injury encountered by this group, and these 118 cases are the basis of this study. Three thousand one hundred fifty-four abdominal operations were performed in this period, and duodenal injury was present in 3.74 per cent of the cases. (Table 1.) Of the 1,168 instances of small bowel injury, the duodenum comprises 10.1 per cent of the cases.

Mortality. Mortality in this series is computed upon the basis of the first ten postoperative days. In the 118 cases, sixty-six deaths occurred within the first ten days, a mortality of 55.9 per cent. There are three instances in which death probably occurred within the first ten days, but the records are incomplete.

Site of Entry Wound. The site of the wound of entry is fairly consistent in duodenal injury. The missile entered the right side of the trunk, either front or back, in ninety-eight or 85 per cent of the 118 cases. Twenty per cent of all wounds were perforating in type. As will be shown later in the discussion of complicating injuries, there is a wound pattern in which duodenal injury may be reasonably expected and sought for. Figure 1 illustrates the approximate area of penetration of the missile in the duodenal injuries of this series and the frequency in actual numbers. (Fig. 1.)

TABLE 1
INCIDENCE AND MORTALITY

Gross Totals

No. Cases	Incidence in 3154 Cases	Mortality Rate (Gross)
118	3.74%	55.9%

Uncomplicated Cases

No. Cases	Incidences of Cases	Mortality
2	1.6	0

Complicated Cases

No. Cases	Incidences	Mortality
116	99.4	56.9

There was one case of duodenal injury without penetration. The patient had a large gutter wound across the epigastrium with omentum herniated through the

wound. No wound of exit was present and a foreign body could not be demonstrated by *x*-ray. It was believed by the operator that the stellate lacerations of the liver and second portion of the duodenum were due to blast.

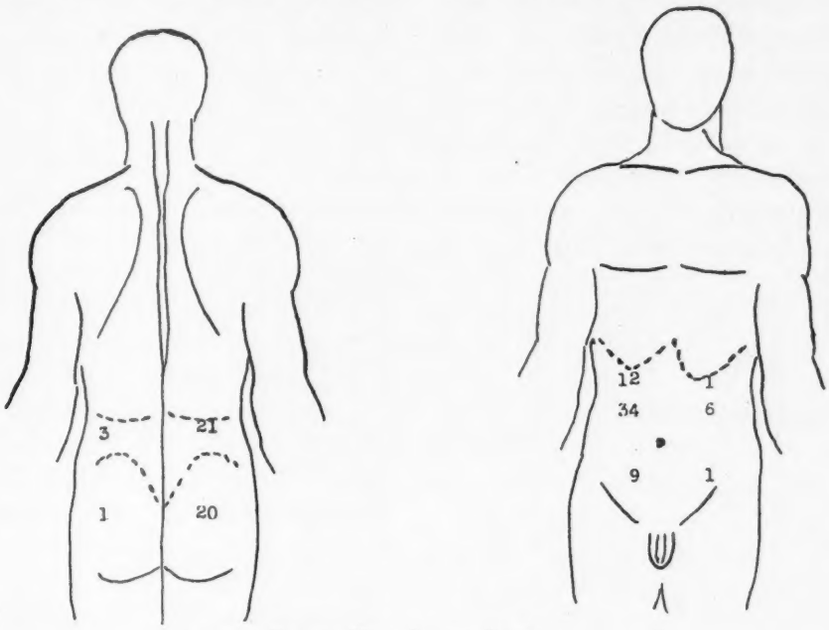

Fig. 1. Site of wound entry.

Shock Record. The shock record upon admission to the hospital is constant in that the patients who subsequently died were in the main in a more severe state of shock than those that recovered. The classification of shock is taken from the records just as recorded. (Table II.)

Table II
DEGREE OF SHOCK

Degree of Shock	Lived	Died
None	14	6
Mild	12	3
Moderate	12	8
Moderately severe	1	6
Severe	9	43

In four instances, the degree of shock was not recorded. Of the nine cases of vena cava laceration, one was in no shock, four in only moderate shock, and four in severe shock.

Cause of Death. Shock and hemorrhage were the recorded causes of death in thirty-nine or 59.5 per cent of the deaths. Forty-seven or 71 per cent of the deaths occurred in the first three postoperative days. Two of the deaths resulting from peritonitis were due to injuries overlooked at operation, one a laceration of the common duct, the other, a perforation of the third portion of the duodenum. (Table III.)

Table III
DAY OF DEATH AND CAUSE

Cause of Death	At Operation	First 24 Hrs.	24 Hrs. to 72 Hrs.	3 to 10 Days	Totals
Shock and hemorrhage	5	25	8	1	39
Pneumonia	..	..	2	7	9
Anuria	..	..	2	6	8
Transfusion reaction	..	..	2	..	2
Pulmonary embolism	..	..	1	..	1
Peritonitis	..	..	..	3	3
No record	..	..	2	2	4

Complicating Injuries. Multiple complicating lesions are usual in duodenal injuries. There were only two cases of damage to the duodenum alone in this

series of 118, an incidence of 1.6 per cent and both patients survived.

In Table IV are shown the complicating lesions in addition to the duodenal injury in actual numbers. These figures are misleading in that in many instances there are multiple lesions to one organ which are recorded in the table as one; it does not take into account the vascular injuries, and further, the extent of the damage to one organ cannot be shown. (Table IV.)

TABLE IV
FREQUENCY OF COMPLICATING INJURIES

No. of Organs Injured in Addition to Duodenum	No. Lived	No. Died	Mortality, Per Cent
1	12	15	55.5
2	25	20	44.4
3	7	14	66.6
4	5	15	75.0
5	1	1	50.0?

Not included in Table IV were the two cases of duodenal injury alone, and one of duodenum complicated by a portal vein laceration. It is seen that with three complicating injuries, the mortality is doubled and with four, it is tripled. The one case recorded as living with five complicating lesions probably died as he was left moribund on the fourth postoperative day with a holding company.

In Table V is shown the greater number of organ resections required in those patients that subsequently died. (Table V.)

Vascular injuries are not an infrequent complicating wound in injuries to the duodenum. In this series of 118, there were nine, or 7.6 per cent instances of vena cava laceration with eight deaths. There were two cases of portal vein laceration, two of the pancreatico-duodenal artery, and one each of the hepatic and right spermatic artery. All of these patients died.

In Table VI are listed the organs most frequently complicating duodenal injury, and the percentage frequency of their involvement. It may be seen from this chart, that there is a fairly constant wound pattern when the duodenum is injured. If, for example, there is a wound of the right upper quadrant that has involved the right kidney, liver, and right colon, an injury to the duodenum is quite likely. (Table VI.)

TABLE V
ORGAN RESECTIONS

Operation	Lived	Died
Splenectomy	1	4
Cholecystectomy	2	6
Nephrectomy	9	12
Right colectomy	2	7
Resection of small bowel	4	9
Gastrojejunostomy	0	4

TABLE VI
INCIDENCE OF COMPLICATING INJURIES TO OTHER VISCERA

	No. of Times Injured	Per Cent
Liver	69	58.47
Colon	59	50.0
Right kidney	37	31.3
Small bowel	36	30.5
Stomach	21	16.1
Gallbladder	17	14.4
Pancreas	9	7.6
Vena cava	9	7.6
Portal vein	2	1.8

The pancreas was involved in 7.6 per cent of the cases in this series. Of the nine cases with pancreatic involvement, eight died. There was only one case in which the pancreatic head was damaged to the extent of severing the duct. Drainage of the damaged pancreas was universally employed, and where possible, the capsule was sutured. All eight of the patients with pancreatic injuries died within the first six days. Fat necrosis was a marked feature in one, both at operation and necropsy.

The gallbladder was injured seventeen times in this series, an incidence of 14.4 per cent. Cholecystectomy was performed

eight times, and the remainder were either sutured, or had a cholecystostomy. Gallbladder injury occurred almost equally in those who lived, and those who died. However, three times as many cholecystectomies were required among the fatal cases.

Associated Injuries. There were fifteen of the 118 cases of duodenal involvement with an associated chest injury. This varied in severity from a simple perforation of the diaphragm to severe laceration or contusion of the lung. Of the fifteen cases with associated chest damage, eleven died.

It is not within the scope of this paper to discuss shock, but it is clearly shown that two factors contributing to shock, vascular injuries with concomitant hemorrhage and chest injuries with disturbance of cardiorespiratory physiology, play a very important rôle in contributing to mortality in this series.

Colon Complications Other than from Direct Injury. Severe damage to the blood supply of the right colon was not an infrequent injury in this series. There were two instances in which the right colon was not perforated, but right colectomy was done because of an avascular colon. In three instances, loop colostomy was done because of an avascular area, one in the right transverse colon, and two in the ascending colon.

TABLE VII
SITE AND TYPE OF DUODENAL INJURY

Site	Transection	Perforation	Laceration
First portion	7	12	8
Second portion	7	34	14
Third portion	1	6	8
Junction of first and second	..	2	4
Junction of second and third	1	2	2
Duodenal-jejuno junction	4		
	20	56	36

Duodenal Damage. Severe damage to the duodenum *per se* is not frequent. In only four instances was the damage severe enough to require a short circuiting procedure. Of the four gastrojejunostomies done, all died. In only one instance was the ampulla of Vater damaged, and there was only one of common duct injury. In no case was it necessary to perform a common duct short circuit. Table VII lists the site and type of injuries to the duodenum. In six cases, the type and location were not recorded.

Complications of Duodenal Repair. A discussion of the complications of a duodenal repair is not within the scope of this paper. In most instances, lacerations and perforations of the duodenum were repaired as any small bowel laceration and the technic varied but little among the individual surgeons. Transections of the duodenum were repaired by end-to-end anastomosis with running atraumatic chromic suture in most instances reinforced with black silk or cotton. In almost every case, the site of the repair was drained and universally when complicating pancreatic or liver wounds occurred. In most instances, the peritoneum was closed over the wound. In three cases in which gastrojejunostomy was done, the duodenum was badly damaged and the proximal end was inverted, but none of these lived long enough to develop any possible complications.

There are two known duodenal fistulas that developed in the field hospital. Both of these were transections of the duodenum with an end-to-end anastomosis. Both developed on the sixth postoperative day. There is an additional case that probably developed a duodenal fistula. The record was not complete, but it had been noted on the sixth postoperative day that a clear irritating discharge was draining through the operative wound, and it was the opinion of the observer that a duodenal fistula had developed. This case was a simple laceration of the second portion of the duodenum, repaired by one row of running atraumatic chromic, reinforced with black silk sutures.

There was one case that probably had a duodenal blow-out, but the necropsy was not done. It was the opinion of the officer who saw him at death, that the duodenal suture had not held. The patient had had a through and through perforation of the upper pole of the right kidney that was drained, and a through and through perforation of the second portion of the duodenum that had been closed with two layers of running atraumatic chromic sutures. On the seventh postoperative day, he became markedly distended, and developed severe epigastric pain and expired in eight hours following the onset of these symptoms.

Diagnosis of Duodenal Injury. The preoperative diagnosis of a duodenal injury has no essential differences from that of any intra-abdominal injury. At operation, it was the practice of surgeons of this group always to reflect the right colon and duodenum where there was any suspicion of a duodenal injury. The increasing consciousness of this possibility is shown in that of nine cases of duodenal injury handled by this group in 1943, there were two perforations of the duodenum overlooked. In the 118 cases in this series done in 1944 and 1945, there is only one case of an overlooked duodenal injury. Too much stress cannot be placed upon the advisability of thorough exploration of the duodenum in cases in which there is any possibility that the missile perforated the retroperitoneal space behind the right colon, and this can only be done by reflecting the right colon.

COMMENTS

It is seen that 99.4 per cent of duodenal injuries have complicating lesions. The most frequent organs involved in order were liver, colon and right kidney. In 83 per cent of the cases the missile entered either right back or right abdomen. With these facts in mind it may be reasonably deduced that a missile entering the right side, front or back, and injuring the liver, colon, and right kidney has a very strong probability of also injuring the duodenum. It is again emphasized that it was the practice of surgeons in this group routinely to reflect the right colon and examine the duodenum thoroughly in any case possessing the wounds as described above and also in any case presenting the probability of a duodenal injury.

Incidence of injury to particular portions of the duodenum was out of proportion to the mass of duodenum and its protection by boney structures such as the vertebra. In 46.6 per cent of this series the second portion was injured. The first in 22 per cent and the third in 12.7 per cent of the cases. In many of the cases of injury to the first portion of the duodenum there was a continuous lesion with the pylorus and similarly in the third portion a continuous lesion of the jejunum. It is surmised that many injuries to the first portion of the duodenum do not survive to reach operation because of the close relationship with the hepatic artery and portal vein and again similarly with the third portion of the duodenum with its close relationship with the aorta, vena cava and mesenteric vessels.

Twenty instances of duodenal transection were encountered in this series. The usual repair was by end-to-end anastomosis with a double layer of chromic catgut reinforced with interrupted black silk. Six of these patients with transections lived through the sixth postoperative day and two of the six developed a duodenal fistula on the sixth day. The frequency of this complication can only be indicated by this small series but it aids in emphasizing the necessity of drainage to a repaired duodenal injury.

SUMMARY AND CONCLUSIONS

1. Injuries to the duodenum are infrequent in abdominal wounds, and very rarely is the duodenum alone involved.
2. In abdominal wounds with duodenal injury, the mortality was 55.9 per cent in 118 cases.

3. In this series, the site of the entry wound was in the right trunk in 83 per cent of the cases.

4. Severe shock was usually present preoperatively in this series.

5. Multiple complicating injuries are usual in duodenal injury. Vascular injuries are not infrequent.

6. It was found that 12.7 per cent of the 118 patients had an associated chest injury.

7. Severe damage to the duodenum is not usual. In only four cases of this series was the damage severe enough to require a short-circuiting procedure. There was only one case of injury of the ampulla of Vater, and in no instance was a common duct short circuit required.

8. There were twenty transections of the duodenum in this series with the development of fistula in two. However, most patients with transections died within the first three days. Six patients with transections of the duodenum lived through the sixth postoperative day. Of these, two developed fistula. There is a strong indication of a high incidence of fistula development in the transected duodenum.

9. It was the practice of the surgeons in this group routinely to reflect the right colon in injuries where there is any reason to suspect a perforation of the duodenum.

REFERENCES

1. Medical History of World War I. Surgeon General.
2. Personal communication.

INTRAVENOUS SODIUM PENTOTHAL AS A BASAL ANESTHETIC*

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A PERTINENT problem in modern surgery has been the control of the mental anguish that possesses the patient who is to undergo surgery. Anesthetists know, too well, the screams of the frightened child, the increased pulse rate and blood pressure readings of the near hysterical woman, and the thyroid storms that are precipitated in patients when they are wheeled into the operating suite.

Because of this, and the desire to be humane, anesthetists have tried to minimize the fear of the "terrible unknown" that confronts the preoperative patient. Sedation with opium or its alkaloids or oral barbiturates is not always effective; and although the patient may appear to be cooperative, the application of the mask or the prick of the spinal needle frequently evokes such protests which result in an emotionally upset patient, surgeon, and anesthetist. More anesthetic is required in the excited patient with the attendant undesirable effects.

Basal anesthesia has proved to be more efficacious. It may be defined as the state of unconsciousness produced by a nonvolatile agent which should serve as a base upon which a complete anesthesia can be built up by the addition of a general anesthetic agent.[4] It has as its prime advantages a smoother induction, a requirement for less of the anesthetic agent, and it results in an unfrightened patient in whom there has been a minimum of psychic trauma and resultant shock. However, this method is not without its attendant disadvantages and even dangers. A satisfactory basal anesthetic must be predictable, controllable, rapidly metabolized or excreted, easily and quickly administered, and must have no deleterious effects on any organ of the body.

The most commonly used basal anesthetics are paraldehyde, avertin (tribromethanol), and the drugs of the barbiturate group. Paraldehyde is safe from the anesthetist's point of view, but is unsatisfactory by reason of its repellent odor which persists for a long time on the patient's breath and by the need for administering it by rectum in large bulk, diluted with saline.

Avertin is neither predictable nor controllable. The same dose may, in one patient, produce a profound narcosis lasting twelve or more hours and, in another patient, cause excitement, thereby defeating the purpose for which it was intended. Doubtless these bizarre effects are due to the variation in the rate and ability of absorption and tolerance by the rectosigmoid colon of each individual. Avertin is metabolized primarily in the liver, and according to Hill[9] it can cause liver damage in a manner similar to chloroform. He believes this is due to their similarity in chemical structure. It is also contraindicated in the presence of rectal or colon disease. Mousel and Lundy[15] warn against oversedating a patient so that his respiration becomes so shallow that he cannot inspire sufficient anesthetic agent to produce relaxation. This effect has been noted with avertin. Also, it may often abolish the cough reflex.[6] Such shallow respirations may persist postoperatively requiring more nursing care and despite this may lead to an increase in pulmonary complications.[8]

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Sise[21] found avertin to be less controllable than the barbiturates.

The search for a basal anesthetic more approaching the ideal has lead anesthetists to experiment with barbiturates for this purpose.[7] That barbiturates can be safely combined with inhalation anesthetics has been amply proven.[3,10,16,19,20] Gwathmey gave nembutal by mouth and by rectum to children and noted elimination of preoperative fear, easier induction and maintenance of anesthesia, earlier return of throat reflexes, and absence of postoperative nausea and vomiting. Hudson[13] was forced to supplement unsatisfactory intravenous evipal anesthesia with ether in three small children and observed no untoward effect but, on the contrary, a very smooth induction resulted. He concluded that induction was more rapid with evipal than with avertin, and that a further advantage was the more frequent production of relaxation.

Organe and Broad reported 236 cases of combined pentothal and nitrous oxide-oxygen anesthesia noting smoothness of induction. Borthwick[1] used barbiturates preoperatively in children with gratifying elimination of screaming and threshing about. Previously, such drugs of the barbiturate series as somnifene, sodium amytal, pernocton and rectidon were much used as basal anesthetics in Europe.[6,8,18]

With the advent of shorter acting, more rapidly destroyed barbiturate derivatives such as evipal and sodium pentothal, which could be given intravenously, attention was turned to this less bothersome, quicker, and more controllable method of providing basal anesthesia.[8,23] Machray[14] advised supplementing the routine morphine and scopolamine with intravenous evipal on the operating table before beginning the inhalation anesthetic. Goldman[6] and Clausen[4] injected sodium pentothal intravenously while the patient was still in his bed, and then moved him, calmly sleeping, to the operating room.

Brooks,[2] who was dealing with patients who had been in combat and due to psychic and physical trauma therefore, were hard to handle, found that intravenous sodium pentothal was an ideal inducing agent. Mousel and Lundy[15] advised putting extremely nervous patients to sleep in bed with intravenous pentothal in 2½ per cent concentration prior to removing them to the operating room.

Hudon[11] described his technic of administering 5 to 10 cc. of a 2 per cent sodium pentothal solution intravenously and immediately following it with cyclopropane-oxygen inhalation. Although this was primarily a method of balanced rather than basal anesthesia, he cited among its advantages a rapid, smooth induction and a decrease of postoperative nausea.

Elliot and Arrowood[5] also described a combined method of intravenous pentothal and nitrous oxide oxygen anesthesia for use in oral surgery.

Hudson[13] and Thomas[22] used intravenous sodium pentothal to put the patient to sleep before moving him to the operating room.

At our hospital we have used the following technic of administering basal anesthesia in adults. One hour preoperatively scopolamine gr. $\frac{1}{150}$ to $\frac{1}{300}$ is given by hypodermic. Morphine is not used both because it is unnecessary and because of the respiratory depression that it causes. In many cases, and especially in cases scheduled for thyroidectomy, the patients do not even know that they are to be operated on that day. Fifteen minutes preoperatively the anesthetist enters the patient's room carrying, as sole equipment, a rubber tourniquet and a 20 cc. syringe containing a freshly prepared 2½ per cent sodium pentothal solution. After a cheerful greeting the patient is asked to hold out his arm so that a sample of blood for "analysis" may be taken. Having had a previous workup, this causes no undue fear or excitement in the patient.

The needle is inserted in the vein and after a 1 cc. test dose has been given, and

its effects observed for thirty seconds, 2 to 5 cc. are slowly injected. Conversation is maintained with the patient until he has fallen into a light sleep. We do not "push" the drug to the point where the reflexes are abolished. We merely want the patient to go to sleep. As soon as this occurs, the nurse and orderly, who are waiting outside the door, are called; the stretcher is wheeled in and the patient is rapidly transported to the operating room and placed on the table. Anesthesia with cyclopropane is then begun and continued to the point where ether can be given without causing cough, or is continued as cyclopropane-oxygen with or without intratracheal intubation. We have also followed this basal anesthetic with a spinal anesthetic and have then used a continuous sodium pentothal drip during the operation to maintain sleep.

COMMENT

We believe this method of basal anesthesia to be superior to any previously employed. It is safer, more controllable, and more predictable than either paraldehyde or avertin by rectum. The sodium pentothal is rapidly metabolized by the body tissue and does not persist in the patient postoperatively as do the others. Our patients have no undue depression of respiration, have a quicker return of reflexes and wake up more rapidly; all of which make for less postoperative pulmonary complications and the need for already scarce extra nursing care. We have used this method successfully in thyroidectomies, amputations of breasts for malignancy, breast plastics, and various gynecological operations all of which are done in patients who are "normally" excitable and in whom an abnormal fear of the operating room exists.

Contraindications to the use of this method are marked anemia, hypotension, cardiac, respiratory, luetic, or allergic disease. It has a wider range of use than avertin, being useable in colon surgery, which contraindicates rectal anesthesia, and it may be used even in the presence of hepatic disease, since it has been shown that Sodium Pentothal is broken down by all the body tissues and not by the liver exclusively as was formerly believed.[15]

Our surgical staff is pleased by the quiet induction, and above all, our patients gratefully tell us that they awaken to find the "horrible" expectancy of operation a fait accompli.

SUMMARY

1. Basal anesthesia is a useful and often necessary procedure in the armamentarium of modern surgery.

2. The properties of a desirable basal anesthetic are given.

3. The various methods of basal anesthesia are discussed.

4. The superiority of intravenous sodium pentothal as a basal anesthetic is presented with a review of the pertinent literature.

5. A technic of basal anesthesia utilizing intravenous sodium pentothal is given.

REFERENCES

1. Borthwick, Leslie K. Preoperative sedation for children. *Canad. M. A. J.*, 46: 345, 1942.
2. Brooks, Angus M. Pentothal sodium with nitrous—oxygen, ether anesthesia. *U. S. Nav. M. Bull.*, 42: 598, 1944.
3. Calderone, Frank A. *J. Pharmacol. & Exper. Therap.*, 55: 24, 1935.
4. Clausen, R. J. Basal anesthesia. *Lancet*, 2: 925, 1937.
5. Elliot, Howard L. and Arrowood, Julia G. Topical anesthesia and administration of pentothal sodium before intratracheal use of nitrous oxide and oxygen. *Anesthesiology*, 6: 32, 1945.
6. Goldman, Victor. Premedication and intravenous anesthesia. *M. Press*, 197: 560, 1938.
7. Gwathmey, James T. Pentobarbital sodium premedication and inhalation anesthesia. *Am. J. Surg.*, 31: 272, 1936.
8. Hewer, C. L. Basal narcosis. *St. Barth. Hosp. J.*, 42: 52, 1934.
9. Hill, B. P. Hypersusceptibility to basal anesthetics. *Brit. M. J.*, 2: 1199, 1938.
10. Horsley, J. Stephen. Pentothal acid; new basal anesthetic. *Brit. J. Anes.*, 16: 1, 1938.
11. Hudon, L. Pentothal-cyclopropane anesthesia. *Laval Med.*, 8: 708, 1943.
12. Hudson, Henry W., Jr. Evipal soluble-admin. to infants and children. *New England J. Med.*, 216: 915, 1937.

13 .Hudson, Maurice W. P. Pentothal and cyclopropane anesthesia. *Anesth. & Analg.*, 23: 174, 1944.
14. Machray, R. Preoperative treatment and premedication. *Brit. M. J.*, 2: 713, 1937.
15. Mousel, L. H. and Lundy, J. S. Preoperative sedation for various operations. *S. Clin. North America*, 20: 907, 1940.
16. Moyer, Carl A. and McKittrick, John B. Practical consideration of open pneumothorax under sod. evip., sod. pent., and ether. *Ann. Surg.*, 116: 553, 1942.
17. Organe, Geoffrey and Broad, Ronald J. B. Pentothal with nitrous oxide and oxygen. *Lancet*, 2: 1170, 1938.
18. Reichold, A. Rectidon as basal anesthetic. *Chirurg.*, 6: 771, 1934.
19. Rondet, Y. and Simeone, A. Evipal sodium in basal anesthesia. *Bordeaux chir.*, 7: 445, 1939.
20. Searles, P. Sodium amytal and ether: effect on the blood. *Am. J. Surg.*, 41: 399, 1938.
21. Sise, L. F. Choice of anesthesia. *Am. J. Surg.*, 34: 419, 1936.
22. Thomas, George J. Pentothal sodium; pharmacologic action, range of usefulness, complications. *Anesth. & Analg.*, 23: 8, 1944.
23. Tuohy, Edward B. Clinical use of intravenous anesthesia alone and in combination with other drugs. *South. M. J.*, 34: 42, 1941.

Many minor operations in the mouth can be performed under local anaesthesia, but if the operation is expected to occupy some length of time and bleeding to be free it is wiser to give a general anaesthetic, preferably with the introduction of an intratracheal catheter.

From "Minor Surgery" edited by Humphry Rolleston and Alan Moncrieff (Philosophical Library).

DOES ANTERIOR GASTROJEJUNOSTOMY PREDISPOSE TO DEVELOPMENT OF JEJUNAL ULCERATION?*

A STUDY BASED UPON NINETY PARTIAL GASTRECTOMIES

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WITH the gradual shift of surgical opinion in the past twenty years away from short circuiting operation for "peptic ulcers" to sub-total gastrectomy, different types of operation were proposed. There has been a gradual evolution of surgical technic beginning with the Billroth 1 to the present day Polyá, Polyá-Balfour, Moynihan, Mikulicz, Hoffmeister-Finsterer operations. In general, it has been found to make little difference just which type of resection and anastomosis is made provided the method is sufficiently radical to permit of wide resection.

There appears to be some controversy of opinion as to whether an anterior gastrojejunostomy or a posterior gastrojejunostomy should be done. Each type of operation has its proponents. It has been said that the anterior gastrojejunostomy, although much simpler to perform, is not as satisfactory as the posterior gastrojejunostomy since the jejunal mucosa much further removed from the stomach is exposed to an unaccustomed gastric content and hence the danger of jejunal ulceration development is greater.[1] This group would have us believe that because the posterior gastrojejunostomy utilized a loop of jejunum much closer to the stomach, its mucosa was much better able to receive the insult of direct reception of gastric contents.

We have undertaken this study based upon ninety partial gastrectomies for "peptic ulcer" in an effort to determine whether the anterior gastrojejunostomy does predispose to the development of a jejunal ulcer. If it can be shown that the mucosa of the jejunum 30 cm. from the ligament of Treitz is as resistant to the irritating effect of the gastric contents as that much closer to the ligament, then that particular objection to the anterior gastrojejunostomy would cease to exist. The ease with which an anterior gastrojejunostomy can be done as compared to the posterior gastrojejunostomy and its absolute freedom from the danger of injury to the middle colic artery, which may occur during the posterior gastrojejunostomy, would indeed make it the procedure of choice in all partial gastrectomies.

In our series of ninety cases, we used the anterior Polyá type of anastomosis. Seven of the cases required a Hoffmeister modification of the Polyá technic. This modification was found very useful in those cases in which the lesion was unusually high up on the lesser curvature and a safer anastomosis could be made by closing a part of the stomach stoma. A long loop of jejunum was brought anterior to the transverse colon and the point of anastomosis was made 30 to 40 cm. from the ligament of Treitz. In all of our cases, we removed sufficient stomach to create a postoperative achlorhydria or hypochlorhydria. In order to standardize our operative technic as far as is possible we used as the upper line of our gastric incision, the point at which the left gastric artery reaches the lesser curvature, and the lower line of the incision reaches the bare (avascular) area of the stomach which is

* From the Department of Surgery, Grace Hospital.

seen between the left and the right gastro-epiploic arteries. (Fig. 1) By removing all the stomach distal to the line of incision

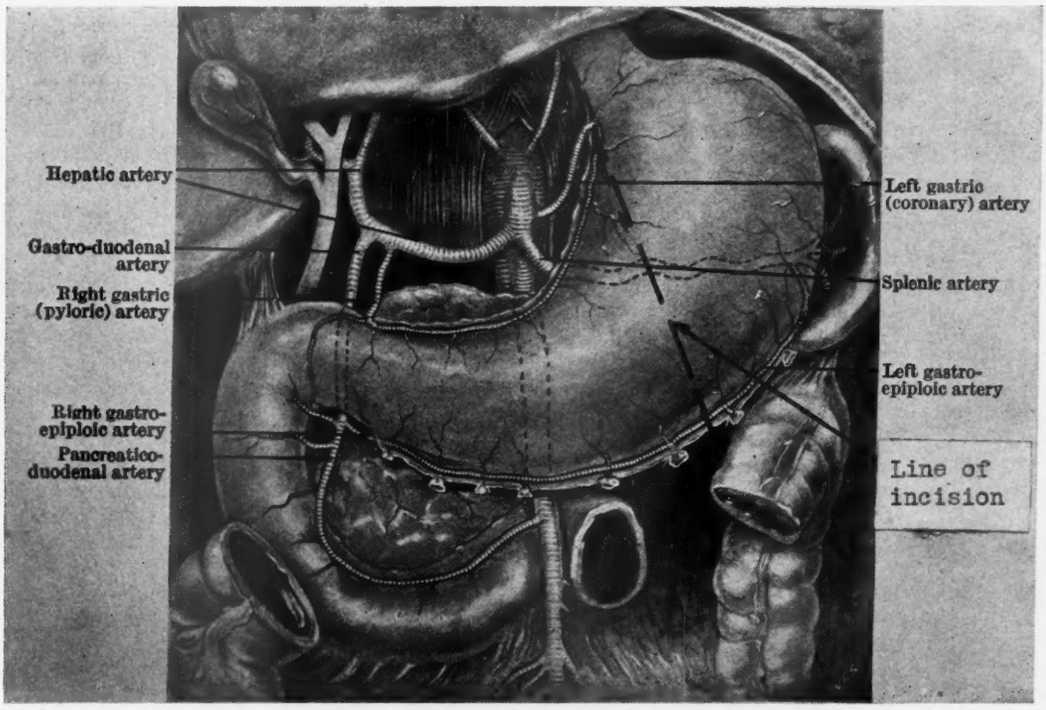

FIG. 1. Note the line of incision between the point at which the left gastric artery meets the lesser curvature and the bare area between the right and left gastro-epiploic arteries. (From Maingot, R. Technique of Gastric Operations.)

just described, all the stomach that is necessary to be removed for a good result was excised. In this way, all the acid-forming tissue was removed from the stomach and also the antral mucosa which appears to regulate acid secretion.[2] Since all the acid-forming tissue has been removed at operation, we have been able to produce an achlorhydria with the result that the irritating effect of the hydrochloric acid from the gastric secretion cannot be considered a factor in the production of jejunal ulcers postoperatively. With the removal of this chemical factor as a possible etiological agent in the production of jejunal ulcers, we are left only with the mechanical irritative factor resulting from the discharge of gastric contents onto a jejunal mucosa which is not accustomed to it.

A glance at the tabulated histories reveals some interesting data. Our youngest patient was twenty-two years old, and the oldest was seventy-two. Both patients had excellent results from the operations performed. Eighty-two of the patients were males and only eight were females. Sixty-nine of the patients were operated upon for duodenal ulcer and twenty-one patients had gastric ulcers. The largest number of patients were between fifty to sixty years old. The age of the patient in no way influenced the decision to do a partial gastrectomy. It is the physical condition of the patient that determined the operability. We did not perform an entero-enterostomy in a single case in association with our anterior gastrojejunostomies. Many of these patients were operated upon five years ago so that adequate time has elasped for jejunal ulceration to develop if this operation predisposed to it.

In our follow-up of these ninety patients, we found not a single patient had developed a jejunal ulceration. When we compare this with studies taken from various surgical centers throughout the country

TABLE I
PATIENTS OPERATED UPON*

Name	Sex	Age	Diagnosis
1. H. C.	M	22	Duodenal ulcer
2. L. B. M.	F	27	Gastric ulcer
3. J. K.	M	27	Duodenal ulcer
4. J. K.	M	27	Gastric ulcer
5. S. I. G.	M	30	Duodenal ulcer
6. G. N.	M	32	Duodenal ulcer
7. G. H.	M	32	Duodenal ulcer
8. W. W. B.	M	32	Duodenal ulcer
9. H. L.	M	31	Duodenal ulcer
10. J. C.	M	34	Gastric ulcer
11. C. H.	M	38	Duodenal ulcer
12. A. L. T.	F	39	Duodenal ulcer
13. W. F. G.	M	40	Duodenal ulcer
14. C. M.	M	41	Duodenal ulcer
15. T. S.	F	41	Gastric ulcer
16. E. E.	M	41	Duodenal ulcer
17. H. A.	M	41	Duodenal ulcer
18. J. B.	M	42	Gastric ulcer
19. R. T.	M	43	Duodenal ulcer
20. M. B.	M	43	Duodenal ulcer
21. C. M.	M	43	Duodenal ulcer
22. H. G.	M	44	Gastric ulcer
23. T. J.	M	44	Duodenal ulcer
24. L. V.	M	45	Duodenal ulcer
25. G. A.	M	45	Duodenal ulcer
26. R. S. L.	M	44	Duodenal ulcer
27. W. M.	M	46	Duodenal ulcer
28. S. J. M.	M	47	Duodenal ulcer
29. A. W.	M	47	Gastric ulcer
30. D. H.	M	47	Duodenal ulcer
31. J. H. M.	M	47	Duodenal ulcer
32. H. L.	M	47	Duodenal ulcer
33. A. B.	M	48	Duodenal ulcer
34. J. B. E.	M	48	Duodenal ulcer
35. O. E. H.	M	49	Duodenal ulcer
36. A. P.	M	47	Duodenal ulcer
37. C. T. W.	M	48	Gastric ulcer
38. F. B.	M	48	Duodenal ulcer
39. C. B.	M	50	Duodenal ulcer
40. M. F. F.	F	50	Gastric ulcer
41. W. G.	M	50	Duodenal ulcer
42. A. M.	F	50	Marginal ulcer
43. K. H.	M	51	Duodenal ulcer
44. E. D. S.	M	51	Duodenal ulcer
45. E. M.	M	51	Duodenal ulcer
46. L. B.	M	51	Duodenal ulcer
47. J. M.	M	51	Gastric ulcer
48. A. M.	M	52	Duodenal ulcer
49. F. K.	M	52	Duodenal ulcer
50. W. B.	M	52	Duodenal ulcer
51. I. W.	M	53	Duodenal ulcer
52. J. J.	M	53	Duodenal ulcer
53. K. K.	M	54	Duodenal ulcer
54. C. W. G.	M	54	Duodenal ulcer
55. K. H.	M	54	Duodenal ulcer
56. H. M.	M	55	Gastric ulcer
57. F. G.	F	55	Duodenal ulcer
58. W. P. M.	M	55	Duodenal ulcer
59. G. M.	M	57	Duodenal ulcer
60. H. B.	M	56	Gastric ulcer
61. E. E.	M	56	Duodenal ulcer
62. M. S.	M	56	Gastric ulcer
63. J. H.	F	58	Gastric ulcer
64. R. R.	M	58	Gastric ulcer
65. A. W.	M	59	Duodenal ulcer
66. T. P.	M	59	Gastric ulcer
67. J. H. C.	M	59	Duodenal ulcer
68. A. B.	M	57	Duodenal ulcer
69. C. E.	M	57	Gastric ulcer
70. J. L.	M	57	Duodenal ulcer
71. M. C.	M	34	Duodenal ulcer
72. J. W.	M	51	Duodenal ulcer
73. L. P.	F	36	Duodenal ulcer
74. H. W.	M	51	Duodenal ulcer
75. W. H.	M	60	Duodenal ulcer
76. M. D.	M	60	Duodenal ulcer
77. T. H. H.	M	61	Gastric ulcer
78. J. D.	M	61	Duodenal ulcer
79. G. A. H.	M	62	Gastric ulcer
80. H. F.	M	62	Duodenal ulcer
81. J. C. C.	M	62	Gastric ulcer
82. J. K.	M	64	Duodenal ulcer
83. G. M.	M	66	Duodenal ulcer
84. J. G.	F	66	Duodenal ulcer
85. D. W. O.	M	71	Duodenal ulcer
86. E. G. B.	M	77	Gastric ulcer
87. G. P.	M	72	Duodenal ulcer
88. H. W.	M	47	Duodenal ulcer
89. A. K.	M	56	Duodenal ulcer
90. R. C.	M	53	Duodenal ulcer

TABLE I (*Continued*)

* The operation in each case was sub-total gastrectomy and all the patients recovered.

performing posterior gastrojejunostomy, it becomes evident that the results we obtained at Grace Hospital are quite favorable. In performing our sub-total gastrectomies, we always make it a point to fasten the proximal loop of jejunum to the lesser curvature just above the anastomosis for a distance of 3 cm. This suture prevents regurgitation of the stomach contents into this proximal loop of jejunum.

COMMENT

Any method of gastrojejunostomy which can be performed with a minimum of hazard should be the operation of choice. Since sufficient gastric acid-forming tissue and the antral mucosa is removed at operation to render the gastric contents relatively achlorhydric postoperatively, it

makes little difference from a chemical irritant point of view as to whether the mucosa of a short loop or a long loop of jejunum is exposed to the gastric contents. We have been able to demonstrate in our series of ninety cases that the mucosa of a long loop of jejunum can withstand the mechanical irritating effects of the gastric contents as well as the mucosa of the short loop of jejunum. The choice of operation would depend then upon which could be done with greater safety. The posterior gastrojejunostomy becomes very difficult in a patient having a short mesocolon or a very fatty mesocolon so that the middle colic artery cannot be readily identified. An injury to the middle colic artery in the performance of a posterior gastrojejunostomy does occur even in the best surgical centers.[3] This necessitates resection of the colon and thus adds to the operative morbidity and risk. If the anastomosis is performed to the right of the middle colic artery instead of to the left, the results are not too good. By the use of the anterior gastrojejunostomy all these pit-falls are avoided; and since we have demonstrated that the anterior gastrojejunostomy does not predispose to the development of jejunal ulcers, we believe it to be the operation of choice. In no case did we perform an entero-enterostomy with the gastrojejunostomy.

CONCLUSION

1. Anterior gastrojejunostomy does not predispose to the development of jejunal ulcers.

2. The mucosa of the jejunum in the long loop is able to withstand the effects of receiving the gastric contents directly as well as the mucosa of the jejunum closer to the stomach.

3. By using the anterior gastrojejunostomy, without entero-enterostomy, all danger of injury to the middle colic artery is avoided.

REFERENCES

1. Prohaska, J. V. Peptic ulcer. *S. Clin. North America*, 24: 50–59, 1944.
2. Best, C. H. and Taylor, N. B. The Physiological Basis of Medical Practice. 3rd. ed. Baltimore, 1943. Williams and Wilkins Co.
3. Marshall, S. J. Surgical management of chronic peptic ulcer. *S. Clin. North America*, 24: 618–629, 1944.

FINGER AMPUTATIONS*

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FINGER amputations are common surgical operations. They may be considered minor or major depending upon the extent and severity. It is certain that the uncomplicated amputation of the distal portion of a phalanx is a minor surgical procedure, but extensive injury to the entire finger or fingers demands surgical skill and judgment necessary for the preservation of the maximum residual function. It has been stated that next to the brain, the hand is the greatest asset of man, and to it is due the development of man's handiwork. It is also an organ of expression and a special sense organ for stereognosis.

Finger amputations occur in all age groups. They are more frequently observed in the adult male whose hands are subjected to injury associated with occupation. Therefore, the industrial surgeon will be frequently confronted with this surgical problem. The common causes for finger amputations are trauma, deformity, and infection. Finger amputations caused by trauma take first place in the list of etiological factors. Among the indications are: (1) Severe soft tissue damage with destruction of skin, facia, and tendons; (2) multiple compound comminuted fractures with or without soft tissue destruction; (3) burns, second and third degree; (4) gangrene occurring from the use of certain chemical agents; viz., aluminum acetate, phenol, and bichloride dressings; and (5) frost bite.

Many severe freshly traumatized fingers demand primary amputation. The immediate judgment in such cases implies that all efforts to save the digit are obviously of no avail. The large majority fall into this group. Amputations are in many instances done without the patient's knowledge or consent. The honest evaluation of the attending surgeon must be depended upon as to what is best. In other less severely damaged fingers, painstaking management may result in a disability which renders the digit useless, and inhibits the maximum functions of the remaining fingers. Amputation is to be considered in this type of case. One must always bear in mind the function of the repaired traumatized digit, that it should be compatible with the maximum residual function. A stiff frozen finger is of no value in work or industry where digital dexterity is of great importance. If the amputation is one of election, complete agreement between the surgeon and the patient is demanded. The question of the patient's desire for amputation on the basis of obtaining financial reimbursement must ever be borne in mind, but in the vast majority of cases, election of amputation will be based on a disability evaluation that is honest.

Most secondary amputations are done at the request of the worker, who preferred no finger to a useless one.

Fingers subjected to third degree burns producing tissue destruction that is irreparable, indicate amputation primarily. Many severe second degree burn cases rendering the finger useless, come to amputation. The advances in dermoplastic procedures in these cases have done much to preserve useful function, and such operations should be considered before amputation is elected.

The use of aluminum acetate, phenol, and bichloride dressings should be dis-

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couraged. If moist dressings are indicated, boric acid or magnesium sulfate is preferable.

Fingers are common sites of frost bite. There is permanent contraction of the vessels with pallor and numbness of the fingers. Subsequent local management should be followed first. Inevitable gangrene indicates amputation.

Deformity frequently occurs secondarily to the severe trauma previously mentioned. This may be of all degrees as stated, and involve the soft and bony structures independently or in combination. Deformity may occur secondary to tendon loss or tendon function loss. In a series of 233 finger amputations done during the period 1935–45 at the Chevrolet Motor Company, Flint, Mich. plant, 8% of whole finger amputations were performed because of unsuccessful tendon healing. It may be due to joint ankylosis either associated with joint destruction from trauma or secondary infection, or both. Ankylosis may occur in flexion or extension, and may involve one or more joints. The digit becomes a foreign body that is useless, individually, and constantly interferes with adjacent finger and hand function. There are frequently associated intractible pain and circulatory changes.

Massive progressive destructive osteomyelitis with adjacent tendon involvement indicates amputation. The hazard of joint involvement and ankylosis rendering the digit useless is ever present. The sulfonamides and penicillin have reduced these conditions to a considerable extent.

The several functions of a hand are described as tactile sense, pick up, grip, and hook. When amputations are to be done, these several functions should be considered. The occupation of the individual should be taken into consideration when decision for amputation is made. A skilled artisan needs tactile sense and pick up. The common laborer needs grip and hook. Tactile sense is obviously lost with finger amputations, as this function is associated with the finger tips. Finger amputation stumps may develop a minimum of return of this function. The pick up function combines the activities of the thumb and fingers. The thumb is the most important digit of the hand, and it enters into part of all the functions of the hand. When it is the seat of any indication for amputation, a careful appraisal of the amount to be removed should be made. Maintenance of pick up function preserves a means by which skilled artisans may carry on. The index finger, ring, fourth and fifth fingers are named in order of their importance to preserve this important function in combination with the thumb. The ideal pick up is by use of the thumb and index finger. The remaining fingers enter into this function in order of their location, as mentioned.

Grip or grasp is the most important function of the hand, with pick up in second place. The former involves the firm coordinated use of the intrinsic and extrinsic muscles. The latter calls for their delicate and dexterious action. Grip or grasp is essential to the heavy duty laborer. Pickup is necessary for the skilled artisan. Both functions overlap in their importance. Absence of the thumb at the carpal-metacarpal joint leaves a hand with finger grip alone. This is a weak hand. Preservation of a portion of the first metacarpal helps. A short proximal phalangeal stump assures a reasonably satisfactory grip. Lost motion of the metacarpal phalangeal joint occurs less often, but does result from direct infection, severe primary destruction, and secondary tendon fixation. The metacarpal phalangeal joints should never be sacrificed unless all efforts at satisfactory preservation of function fails. The knuckle line should be preserved, if possible, as this aids grip. If amputation of all fingers is under consideration, short finger stumps will maintain the knuckle line. One should constantly bear in mind the saving of as much as possible. If ankylosis occurs with the metacarpal phalangeal joints in extension, a hook hand results; grip is lost; pick up and hook

functions remain; this hand is inadequate for heavy duty; adjusted occupation is necessary.

The most careful judgment is necessary to avoid removal of too much of the hand. In many instances tissue that upon first examination appeared to be hopelessly injured, will heal with a reasonably satisfactory result. A single finger or portion thereof and a functioning thumb, for example, are always superior to any artificial device. If the disability involves the index finger and is complete, with involvement of all joints, amputation is best done in the mid-metacarpal area. This insures a better muscle pad and cosmetic result. The second finger then assumes the duty of the first. If the disability involves the second finger, the same procedure is indicated with the same results. If the middle and fourth fingers are involved, amputations at the proximal ends of the first phalanges are advised in preference to disarticulations. Disarticulations give unsatisfactory results anywhere. One should avoid metacarpal phalangeal joint excisions of the ring and fourth fingers to prevent the v-shaped deviation of the adjacent fingers.

Short dorsal and long palmar flaps are preferable. Flaps should be made of sufficient length to assure a satisfactory pad, although a short flap can sometimes be used when there is an attempt to save as much of the finger as possible, and utilize adjacent tissue that appears viable. When finger tips are traumatically amputated, and revision of flaps is indicated, utilize as much of the skin on the palmar surface as possible, as this partially preserves tactile sense. Split thickness skin grafts have been used successfully for stump coverage. Bone should be cut smoothly and periosteum should be removed from the severed ends. Nerves are divided high. Tendons are severed and allowed to retract. The intrinsic muscles will be sufficient for stump function. Immobilization of stumps has occurred when tendons were sutured over the bone ends. Good hemostasis is essential, and drainage instituted when infection is anticipated.

Cases are obviously individualized and management must be conservative and concentrated. By attention to the essential details of this common surgical problem, many subsequent plastic and reconstruction operations are eliminated.

INTERLAMINAR SPINAL ANESTHESIA*

AN ALTERNATIVE LATERAL APPROACH FOR SUBARACHNOID PUNCTURE

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IN the routine administration of spinal anesthetics, the usually adopted posteromedian lumbar interspinous approach proves suitable in most instances. However, in the average experience, difficulties are encountered in introducing the spinal needle according to standard recommendations with sufficient frequency to warrant occasional utilization of a satisfactory, although little known alternative method.

Interlaminar, or sublaminar lumbar puncture is a relatively simple and easy procedure that may be resorted to when initial median interspinous puncture is difficult or unsuccessful. On occasion, anesthetists, faced with spinal canals apparently impenetrable between lumbar spines, have suggested abandonment of spinal for a general anesthetic. In such instances, substitution of the interlaminar approach will secure for the surgeon the desired technical advantages of intrathecal anesthesia.

We do not offer this as a new maneuver. Dr. John Linder, who was director of the surgical service at the Beth-El Hospital, and who retired from active practice several years ago, often used the lateral route, and occasionally, when he encountered difficulty, angled his needle and slid it along the bony lamina into the subarachnoid space. It is quite possible also that earlier investigators experimented with this maneuver of thecal ingress. At the present time, however, the method appears to be very little known and in almost complete disuse. Search of a considerable body of the available literature since the time of Quincke[10] and other pioneers in spinal anesthesia, discloses no mention of the procedure.[1,2,3,4,5,7,8,9,14] For this reason, the

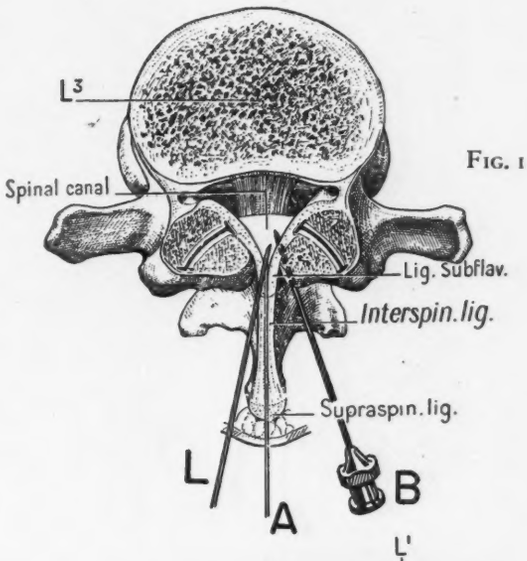

FIG. 1.

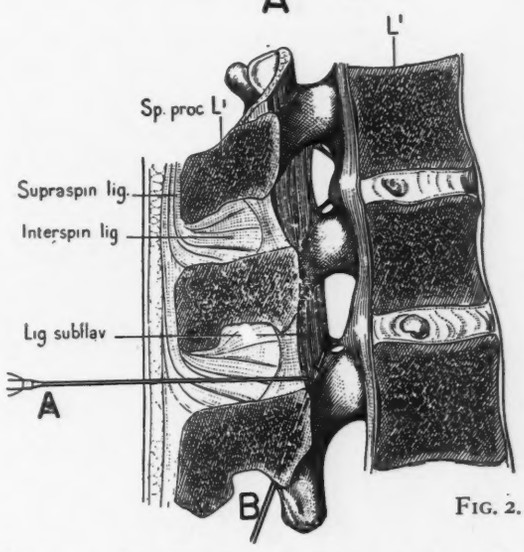

FIG. 2.

FIGS. 1 and 2. Figure 1 is a cross section and Figure 2 a sagittal section of the lumbar spine. Modified from Labat "Regional Anesthesia," by permission of W. B. Saunders Company. A, conventional interspinous approach. The direction of the needle is perpendicular to the surface of the skin, between the spinous processes through the supraspinous and interspinous ligaments. B, Interlaminar approach. Angular direction of the needle along the spinal lamina through the much thinner ligamentum subflavum. L, Lateral approach. Needle is perpendicular to the skin lateral to the spinous processes and directed medially.

* From the Surgical Service of the Beth-El Hospital, Brooklyn, New York.

authors believe that publication is indicated to draw attention to this generally overlooked avenue for thecal ingress.

FIG. 3. Lateral view.

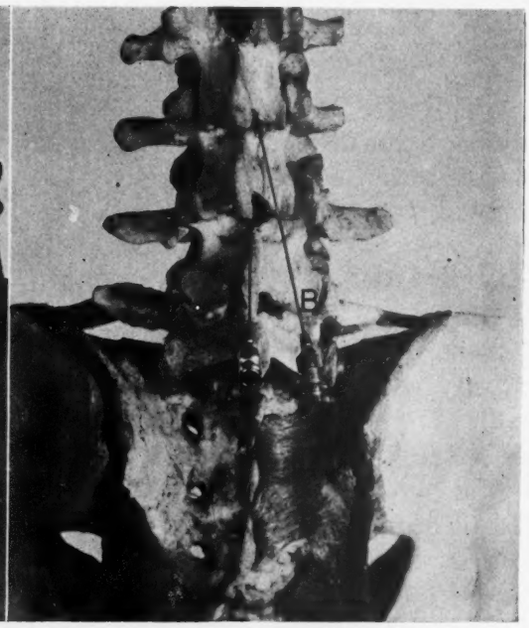

FIG. 4. Posterior view.

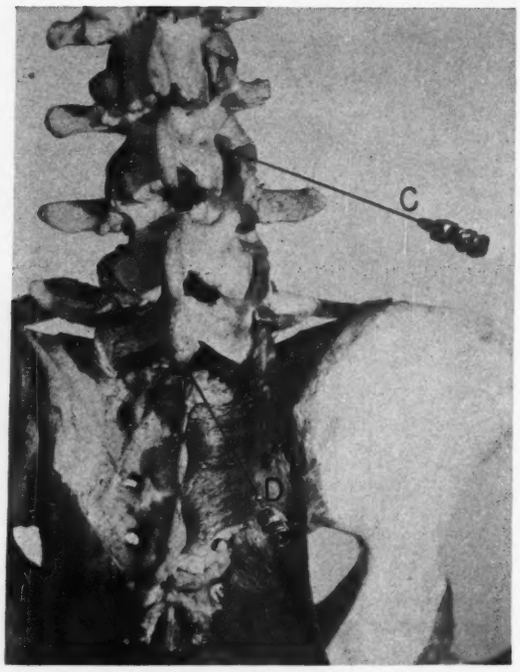

FIG. 5. Oblique view. Regional bony anatomy of approach to lumbar subarachnoid space (Figs. 3 and 4) through: A, conventional interspinous route; B, interlaminar route; in Figure 5, C, through intervertebral foramen; D, lumbosacral space.

In carrying out the procedure, the patient's back is arched, whether sitting up or on one side, just as in the usual manner. However, maximal flexion is not as essential, since separation of the spines is not necessary, and the increase in the interlaminar bony gaps is only moderately augmented as the lower spine is made convex. The procedure can, therefore, be carried out in the ventral prone position. The interlaminar space between vertebrae is narrower laterally than medially, but is wide enough to permit facile entry of the tip of the spinal needle for the required distances. A comparatively long spinal needle, e.g., 10 to 15 cm. of the usual gauge, is introduced subcutaneously about 1.5 cm. to 2 cm. lateral to the tip of the fourth or fifth lumbar spinous process. It is then directed cephalad and forward and slightly medially at an angle of approximately 30 to 45 degrees with the plane of the skin overlying the vertebral column and advanced until bone or spinal fluid is encountered. When bone is encountered, and it usually is, the needle is made to glide forward along the lamina by a to-and-fro movement, slightly varying the angle and advancing gradually until the laminar hiatus is reached. The lower border of the superior lamina may engage the trocar, guiding it into the subarachnoid space. The usual

3½ inch spinal needle may have to be inserted all the way up to the hub. The possible risk of entering the cord proper or the spinal canal does not exceed that of the interspinous course. The fundamental distinction to be kept in mind is that in this technic the direction and course of the needle are determined by the slanting position of the vertebral laminae, and not by the horizontal direction of the spinous processes.

The accompanying illustrations demonstrate the regional bony anatomy and the proper direction of the needle. It is well to bear in mind that the needle enters the subarachnoid space a vertebra higher than the level of puncture of the skin.

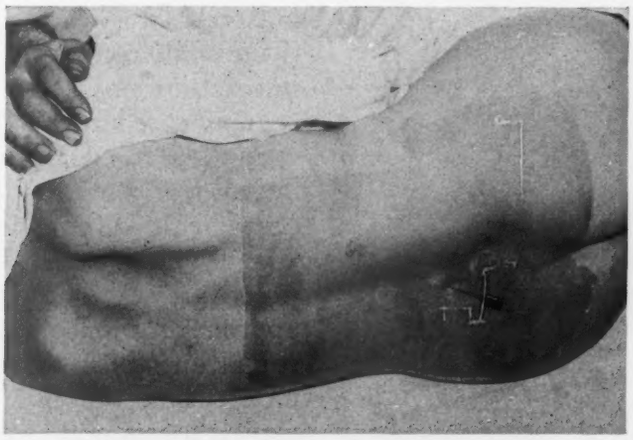

Fig. 6. Photograph illustrating proper direction of the needle 1.5 cm. from the midline at the level of the crest of the ileum, at an angle of about 40 degrees directed cephalad, forward and slightly medially.

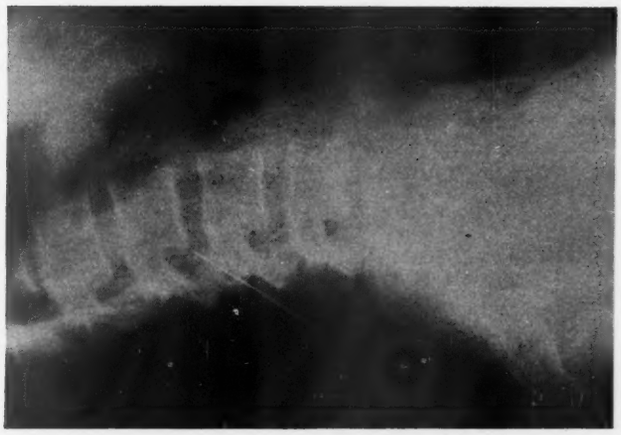

Fig. 7. Lateral *x*-ray view of spinal needle in second lumbar space. Note that spine need not be flexed.

In the technic of lumbosacral subarachnoid tap presented by Taylor[12] in 1940 for urologic cases, and more recently redescribed by Schuetz[11] for operations on the rectum, bladder, prostate and vagina, the slant of the dorsal surface of the sacrum is similarly utilized. The patient is in the ventral prone position. The skin is punctured at a point 1 cm. below and 1 cm. medial to the lowermost prominence of the posterior superior iliac spine. A long needle is directed upward and medially at an angle of about 55 degrees toward the level of the spine of the fifth lumbar vertebra. The needle is guided by the dorsal surface of the sacrum and enters the lumbosacral space at the midline.

Lateral spinal puncture is described as a method of puncture in which the spinal needle is introduced to one side of the mid-

FIG. 8. *X*-ray of spinal needle guided by the lamina into subarachnoid space in ventral prone position, obese patient. Note length of needle (6 inches).

line, perpendicular to the skin, and guided medially so as to penetrate the canal at approximately the median line. The spinal meningeal venous plexus is supposedly avoided at this site, and in avoiding an entirely central course, the needle does not traverse the complete depth of the supraspinous and interspinous ligaments, both of which are well developed in the lumbar region. We have found that venous bleeding is induced less frequently by the interlaminar technic proposed than in the usual lateral or dorsomedian routine. Furthermore, the interlaminar ligaments or the ligamenta flava, which are penetrated by the interlaminar approach, are considerably thinner than the supraspinous and interspinous ligaments, which are thus avoided.

Where flexion of the patient is difficult or impossible, as in the cardiac, or in the fused spine, or in general peritonitis, or when the patient must remain prone, interlaminar subarachnoid puncture may be performed without hindrances otherwise met. In cases in which osteoarthritis bridging is present, a suitable space can generally be found between two lower lumbar laminae even if the spine cannot be flexed at all, or even in opisthotonos.

In no case have the authors found it necessary to forego spinal anesthesia solely because of a mechanically unsatisfactory or difficult subarachnoid puncture, since where one method failed, the alternate procedure was successful. This avenue of approach may also be utilized for fractional spinal anesthesia by the method of Lemmon[6] using the malleable needle, or by using the ureteral catheter as described by Tuohy.[13]

SUMMARY

An interlaminar approach for spinal subarachnoid puncture and its advantages are described. The method is recommended as an alternate to the usual interspinous mode of administering spinal anesthesia.

REFERENCES

1. DOGLIOTTI, A. M. Anesthesia. Chicago, 1937. S. B. Debour.
2. EVANS, C. H. Spinal Anesthesia. New York, 1929. P. B. Hoeber.
3. FLAGG, P. T. The Art of Anesthetics. Philadelphia, 1944. Williams & Wilkins Company.
4. HEWER, C. L. Recent Advances in Anesthesia. Philadelphia, 1944. Blakiston Company.
5. LEVINSON, A. Cerebrospinal Fluid in Health and Disease. St. Louis, 1929. C. V. Mosby.
6. LEMMON, W. T. A method of continuous spinal anesthesia. *Ann. Surg.*, 3: 141–144, 1940.
7. LUNDY, J. S. Clinical Anesthesia. Philadelphia, 1942. W. B. Saunders Company.
8. MAXSON, L. H. Spinal Anesthesia. Philadelphia, 1938. J. B. Lippincott Company.
9. MINNITT, R. J. and GILLIES, J. Textbook of Anesthetics. Baltimore, 1944. Williams & Wilkins Company.
10. QUINCKE, H. Die Lumbalpunction des Hydrocephalus. *Klin. Wchnschr.*, 28: 929–933: 965–968, 1891.
11. SCHUETZ, C. E. Lumbosacral subarachnoid block. *California & West. Med.*, 63: 64–65, 1945.
12. TAYLOR, J. A. Lumbosacral subarachnoid tap. *J. Urol.*, 43: 561–564, 1940.
13. TUOHY, E. B. Continous spinal anesthesia. *Anesthesiology*, 5: 142–148, 1944.
14. VEHRS, G. R. Spinal Anesthesia. St. Louis, 1934. C. V. Mosby.

FURTHER EXPERIENCE WITH CONTINUOUS CAUDAL ANALGESIA IN OBSTETRICS*

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OBSTETRIC analgesia in the form of continuous caudal block has been adopted by us as the method of choice for relief of pain during labor. Our preliminary report[1] dealt with the results in 250 patients showing that its use facilitates cervical dilatation, permits normal descent of the presenting part, is adequate anesthesia for delivery, diminishes blood loss, and has no untoward effect on the parturient or fetus. We also emphasized that the immediate postpartum course was smooth, uncomplicated and differed in no respect from the course following the use of any other method of analgesia. These results previously reported and those herewith presented were accomplished by providing adequate personnel and proper team work between the "caudalist" and the accoucheur. Such cooperation and the constant watching throughout labor and delivery is of utmost importance in the safe and effective administration of this type of obstetric analgesia.

We have not deviated from the method of administration of continuous caudal analgesia as originally described by Hingson and Edwards.[2] Metycaine (1.5 per cent) is used and it is introduced through a malleable needle (No. 19 G.). We discontinued the routine use of ephedrine in the metycaine solution because of increased bleeding during the delivery, particularly from the pelvic floor lacerations or episiotomy. We administer ephedrine sulfate only where the systolic blood pressure reading prior to administration of the analgesia is 100 mm. of mercury or less. Only on very rare occasions was it necessary to give ephedrine during the course of labor or delivery to combat a serious drop in the systolic blood pressure.

During the past two and one-half years there were 6,756 deliveries. We administered continuous caudal analgesia to 1,639 patients. Of these 1,525 had complete relief from pain during labor and delivery. Table 1 shows that forty patients had only partial relief from pain during labor and delivery was accomplished by supplementary inhalation anesthesia. There were also seventy-four patients who had no relief from pain at all. Both of these groups are classified as failures.

TABLE 1
EFFECTIVENESS OF CONTINUOUS CAUDAL ANALGESIA

Complete relief of pain		1,525
Failures		114
Partial relief of pain	40	
No relief of pain	74	
Total		1,639

Dislodgment of the needle or inability to block the eleventh and twelfth dorsal nerves effectively accounted for most of the partial failures. In most of the latter instances there was no pain during delivery and repair; but painful uterine contractions continued during labor. A larger than usual caudal canal, defective posterior wall of the caudal canal or the presence of accessory openings on the posterior wall of the caudal canal accounts for the defective block.

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The complete failures were due to inability to enter the caudal canal because of excessive fat pad, atresia of sacral hiatus, and distortions and malformations of the bony landmarks in the scarococcygeal area. We are also including in this group cases in which spinal fluid was obtained because of perforation of a low-lying dural sac.

TABLE II
TYPES OF DELIVERIES UNDER CONTINUOUS CAUDAL ANALGESIA

Spontaneous	93
Low forceps	1,225
Midforceps	52
Manual rotation and midforceps	103
Forceps rotation	19
Breech extraction	10
Cesarean section	20
Internal podalic version	3

Table II shows the types of deliveries in the 1,525 patients who were delivered under this form of analgesia. A high incidence of operative deliveries results from the use of any form of obstetrical analgesia. The increase, however, is limited to low forceps and "outlet" forceps. Routine use of low forceps and episiotomy on all primipara has become standard even when no analgesia is used. Similar management is advised during subsequent deliveries in order to maintain adequate pelvic floor support and prevent rectocele and even cystocele.

Mengert[3] and Baptisti[4] insist, however, that when continuous caudal analgesia is used other operative procedures are increased. These procedures are necessary because of failure of occiput-posterior positions or deep transverse arrest of the head to rotate and descend spontaneously. It is claimed that the obliteration of the bearing down reflex by the use of continuous caudal block and the marked pelvic floor relaxation prevents spontaneous rotation to the anterior position, thus necessitating intervention to effect delivery.

For a long time we have believed that the early correction of an occiput-posterior position or deep transverse arrest after full dilatation was of decided benefit to the parturient and to the fetus. Although a waiting period might be permitted it is not necessary. With the cervix fully dilated and the head in either malposition, every forceful exertion produces pressure and traumatizes the soft tissue structures of the birth canal. These forceful "tries," particularly in such instances, may cause injury to the uteropubic fascia by stretching or lacerating its fibers or by submucosal hemorrhages, laying the groundwork for the formation of cystocele. These continued forceful exertions also cause similar damage to the parametrial tissue and the cardinal ligaments of the cervix predisposing to early descensus and beginning prolapse of the uterus. It cannot be denied, also, that intracranial hemorrhage in the fetus is frequently the direct result of permitting patients with the above mentioned malpositions to continue long in the second stage. It appears that the elimination of all these bearing down attempts and early correction of the malposition traumatizes to a minimum the soft tissue structures of the birth canal. Bill[5] has long advocated a watchful waiting policy during the first stage of labor in occiput-posterior positions but insists that early correction and delivery after complete cervical dilatation is more beneficial to mother and infant.

Early in the onset of labor in occiput-posterior position or deep transverse arrest, the pains, although frequent, are ineffectual and mainly limited to the lumbar region. This type of ineffectual labor may continue for many hours without any appreciable progress in dilatation or descent, but nevertheless produces physical and psychic exhaustion. In these instances preliminary sedation with morphine sulfate (gr. ¼) to span this early period of ineffective labor, is advisable. After a lapse of several hours, when a 5 or 6 cm. dilatation is reached, a tight Beck[6] binder is applied to fix the presenting part in the pelvis and steady the fetal ovoid. The application of continuous caudal analgesia at this point gives the patient complete relief from pain during the remainder of labor. Full dilatation is reached rapidly and spontaneous correc-

tion of the malposition and descent in many instances takes place. If anterior rotation is not reached, early correction and delivery are performed.

TABLE III
MAJOR OPERATIVE DELIVERIES

	Under Caudal	Not under Caudal
Total deliveries	1,525	5,231
Manual rotation and midforceps	103	129
Forceps rotation	19	17
Midforceps	52	57
Internal podalic version	3	10
Percentage of major operative deliveries	10.9%	4%

In Table III are listed the major operative deliveries in the 1,525 patients who received continuous caudal analgesia, and in the 5,231 patients who were delivered without this form of analgesia. There were 177 such deliveries under caudal block or an incidence of 10.9 per cent. Where no continuous caudal analgesia was used the incidence of major operative deliveries was 4 per cent. This appears to be a high incidence of operative deliveries; but our policy of early interference in the second stage accounts for this more than the type of analgesia. Furthermore, the ease and safety with which these procedures can be performed under this form of analgesia dictates the policy of earlier interference.

TABLE IV
COMPLICATIONS FOLLOWING DELIVERY

	Under Caudal	Not under Caudal
Laceration of cervix	2	13
Duhrssens incisions	0	3
Retained placenta	2	13
Postpartum hemorrhage	1	9

The complications following delivery under this form of analgesia are much fewer. Table IV shows that laceration of the cervix occurred two times and there were no instances of Duhrssens incisions. The placenta was retained on two occasions and only one case of postpartum hemorrhage was found in our entire series of 1,525 cases in which continuous caudal analgesia was used.

In the group in which no continuous caudal analgesia was used, although the operative incidence was lower, the complications were more numerous. Here we found thirteen cases of laceration of the cervix, thirteen retained placentas, nine instances of postpartum hemorrhage and three cases which needed Duhrssens incisions.

We find now, as in our preliminary report, that continuous caudal analgesia has no effect on the initiation of respiration in the newborn. Even in instances in which prolonged inhalation anesthesia is not used for the delivery and only a slight amount is given as the presenting part clears the perineum, initiation of respiration is sometimes delayed. Under continuous caudal analgesia respiration is initiated even before complete delivery is effected. As the head slips over the perineum and the anterior shoulder is being fixed under the symphysis to deliver the posterior shoulder, the infant emits a cry. There were ten stillbirths in this series. In six instances the fetal heart sounds were absent or there was doubt as to their presence before the analgesia was instituted. Maceration was found in all these instances in varying degrees. The other cases were obviously due to obstetrical traumatic deliveries, three instances of version following failure of forceps and one instance following a difficult midforceps delivery.

We encountered only the minor complications reported by Gready.[7] Inability to enter the caudal canal due to excessive fat pad in the sacrococcygeal area caused three instances of superficial infection over that area. This was undoubtedly due to the deposit of the metycaine solution superficially, on the erroneous assumption that the needle was in the caudal canal.

There were four instances of dural puncture and clear spinal fluid was obtained. In all of these instances the administration of continuous caudal analgesia was abandoned. However, we had three other instances of inadvertent spinal anesthesia despite the fact that after a short waiting period following the introduction of the needle into the caudal canal no spinal fluid was obtained. The symptoms of spinal anesthesia were recognized soon after the administration of the first 8 cc. of anesthetic fluid. In each instance it was recognized by rapid cessation of all pain, rapid advance of the level of anesthesia above the umbilicus, loss of muscular tone of the lower extremities and very early rectal sphincter relaxation. It is important to be aware of these signs early, lest the subsequent fractional doses be administered and produce serious massive spinal anesthesia. When these signs were noted and adequately appraised, the needle was withdrawn. In each instance the patient had enough anesthesia for labor and delivery.

We also met with high level caudal analgesia in four instances. This developed despite slow administration of the solution and only when indicated, i.e., when pains returned and the level of anesthesia was much below the umbilicus. In these instances the introduction of the usual 20 cc. of 1.5 per cent metycaine, although properly spaced, caused the patient to become suddenly restless, anxious and with visible shaking of the upper extremities and trunk. They complained of precordial pressure and dizziness. The anesthetic level reached up to the neck. Such instances are explained by small epidural and narrow lateral dural spaces which permit the fluid to diffuse rapidly upward. These were easily combatted by elevation of the head and trunk to permit downward gravitation of the anesthetic fluid. The patient was assured and comforted and in a matter of minutes the symptoms disappeared and labor was permitted to continue. Delivery and subsequent course were uneventful. Subsequent injections, when they became necessary, were reduced to 10 cc. at each dose.

There were no instances of nerve injury, bone injury, inadvertent intravenous injection, broken needle or false passage of the needle. Where the analgesia was used for a period longer than six or eight hours there was postpartum urinary retention and loss of rectal sphincter control. These symptoms were temporary and they disappeared early in the postpartum period.

We had one maternal death in a patient who received continuous caudal analgesia for labor and delivery; but it did not appear that death was due to the analgesia.

CASE REPORT

F. W., thirty-five years old, para 1, gravida 11, had a difficult delivery by Duhrssens incisions of the cervix and midforceps three years previously. She had, however, a normal puerperium and no subsequent pelvic complaints. She was admitted in mild labor, and after several hours her pains became regular, strong, occurring every three to five minutes. When she reached five cm., dilatation and the head was at the spines, continuous caudal analgesia was administered. Cervical dilatation was slow, and after four hours she was only 9 cm. dilated and the head was 1 cm. below the spines. During the entire time the anesthetic fluid was administered in 20 cc. doses only when the level fell below the umbilicus and pains became perceptible. This occurred at about forty-five minute intervals.

Full dilatation was reached two hours later and at that time the head was 2 cm. below the spines. At this time the level of the anesthesia was tested and found to be below the umbilicus. She complained of slight pain over the right side immediately above the symphysis. She was given the last dose of 20 cc. of 1.5 per cent metycaine, the needle was removed and the patient was made ready for transfer to the delivery room. During the six hours of the administration she had no complaints.

When she was placed on the delivery table she became cyanotic, restless, complained of dizziness and involuntarily removed her legs from the stirrups. Inhalation of oxygen eliminated the cyanosis and delivery of a living male infant by outlet forceps and episiotomy was

easily accomplished. The placenta was expressed intact five minutes later and the episiotomy was repaired. During this time the patient had several more attacks of cyanosis and restlessness, but oxygen inhalation successfully combatted them. Shortly after the delivery she became markedly cyanotic. The pulse was slow, of fair quality and regular. The blood pressure could not be obtained. Despite continued oxygen administration, coramine and adrenalin medication and artificial respiration she expired about forty minutes after the first of the symptoms appeared.

Consent for postmortem examination could not be obtained. Blood and spinal fluid specimens, however, were obtained a few minutes after death and were sent to the Eli Lilly Laboratories[8] for detection of presence of metycaine. No metycaine was found in either specimen. The total amount of metycaine used (1.5 per cent) was 150 cc. over a period of almost seven hours.

The absence of metycaine in the spinal fluid excluded death due to massive spinal anesthesia. Similarly, the absence of metycaine in the blood eliminated metycaine intoxication as a cause of death. It appears, from the clinical picture, that death might have been due to pulmonary embolism. A similar complication has been reported by Diddle and Hill.[9] Complete postmortem examination of their case revealed the unusual source of the embolus to be the extradural venous plexus of the sacral spinal canal. The use of a No. 15. G. needle to enter the caudal canal might well cause sufficient trauma for complications. Other sources of pulmonary embolism are possible in obstetric patients.

SUMMARY*

1. Continuous caudal analgesia was attempted in 1,639 obstetric patients. Complete relief from pain was obtained in 1,525 patients. Forty patients had only partial relief from pain while seventy-four had no relief. Anatomical malformation was the main reason for the partial and complete failures.

2. Early correction of occiput-posterior position and deep transverse arrest account for the increase in major operative deliveries and not the analgesic method used. Such early correction prevents soft tissue trauma, prevents pelvic relaxations and displacements and intracranial damage in the fetus.

3. There was a higher percentage of major operative deliveries when continuous caudal analgesia was used. The complications during and following delivery, however, were much fewer than those found in the cases in which the major operative procedures were done with other forms of anesthesia.

4. There is no delay in initiation of fetal respiration. Fetal distress is very rare. Ten stillbirths occurred; six were suspected before the analgesia was started and were confirmed by presence of maceration. Four stillbirths were due to obstetrical trauma.

5. Some of the minor complications to the mother have been noted and discussed. There was one maternal death which occurred after delivery and after six hours of uneventful continuous caudal analgesia. It is doubtful that this method of analgesia was the cause of this death.

* Since this article was submitted for publication we administered continuous caudal analgesia to over 700 more patients. The results and conclusions are substantially the same as described above.

REFERENCES

1. Levine, Wm. et al. *Am. J. Surg.*, 54: 31–39, 1944.
2. Hingson, R. A. and Edwards, W. B. *J. A. M. A.*, 121: 225, 1943.
3. Mengert, Wm. F. *Am. J. Obst. & Gynec.*, 48: 100–103, 1944.
4. Baptisti, A., Jr. *Am. J. Obst. & Gynec.*, 48: 103–108, 1944.
5. Bill, A. H. *Am. J. Obst. & Gynec.*, 22: 615–625, 1931.
6. Beck, A. C. *J. A. M. A.*, 83: 753, 1924.
7. Gready, T. G., Jr. *J. A. M. A.*, 123: 671–675, 1943.
8. Personal communication.
9. Diddle, A. W. and Hill, A. M. *West. J. Surg.*, 51: 427, 1943.

TRAUMATIC PALMAR ANEURYSM

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THE advent of World War II has brought into increasing prominence the subject of traumatic arterial aneurysm, and the frequency with which one encounters articles on this topic in the surgical literature attests to the growing importance of traumatic vascular lesions. Matas' review[6] of blood vessel injuries in World War I revealed the fact that aneurysm occurred in 1 per cent of all wounds of the extremities, a figure that included both arteriovenous and arterial types. The incidence, therefore, of both true or pseudo-arterial aneurysms must have been smaller. Although it is too early for the compliation of any reliable statistics for World War II, one can be quite sure that as a result of the better trained surgeons available in forward areas in this war, death from hemorrhage resulting from vascular injury has decreased, and traumatic aneurysm, the sequela of such injury, has increased.

In general, aneurysm of peripheral vessels may be divided into two main groups:[12,13]

I. Arterial
  (a) Acquired
    (1) Result of trauma
    (2) Result of degenerative disease
  (b) Congenital
II. Arteriovenous
  (a) Acquired
    (1) Result of trauma
    (2) Result of degenerative disease
  (b) Congenital

In this paper, we shall limit ourselves to a discussion of traumatic arterial aneurysms of the palmar vessels, and where indicated, interpolate some observations on acquired arterial aneurysms in general. As a group, the traumatic arterial type of aneurysm may be subdivided into two categories, both of which are characterized by damage to the vessel wall resultant from some form of trauma. The true form is distinguished by a weakened arterial wall which is pushed ahead by the dilatation, producing a sac which has a neck through which it communicates with the main vessel and whose contents are liquid and coagulated blood in various stages of resolution. In the false variety or pulsating hematoma there is a destruction of the vessel wall with an ensuing spillage of varying quantities of blood, the formation of a hematoma which may or may not be well demarcated by the surrounding tissue, and which may burrow into soft structures or dissect along fascial planes. Once the active spread of blood has stopped, a process of absorption, organization, and the proliferation of fibroconnective tissue elements sets in, with the formation of a retaining sac. As this process continues, the sac eventually becomes lined with an endothelium similar to that of the injured vessel while its wall assumes a tough elastic quality. A multiplicity of aneurysmal shapes results, the end-product depending on the character of the surrounding structures and the varying degree of resistance they present to the developing tumefaction. The time required for the development of such a sac is variable, but an extravascular hematoma may become organized into a fibrous aneurysm in six weeks. From this description, it can be seen that the differentiation between a false and a true aneurysm can be made on the absence or presence of muscle elements in the wall of the aneurysmal sac.

A survey of the literature on traumatic palmar aneurysm reveals the interesting fact that the incidence of this lesion is considerably less than might be expected. When one considers how richly vascularized is the palm of the hand, and how

frequently exposed it is to trauma of all sorts, one would expect the palm to be a most likely site for the development of traumatic aneurysms. And yet the reverse is true, for such lesions are comparatively rare. Middleton's review[1] provided seventy recorded cases up to 1933, fifty-four of which were false and sixteen true aneurysms. The false aneurysms resulted from puncture wounds of the hand with one exception, that in which the aneurysm followed subcutaneous rupture of an artery during the reduction of a metacarpophalangeal dislocation. The true aneurysms, representing the localized ectasia of one of the palmar vessels, were relatively rare occurrences and the majority of such cases were traumatic in origin. A single case[3] was recorded in which the arterial affection associated with subacute bacterial endocarditis was considered to have followed blocking of the vessel by an embolus. Where no obvious cause could be assigned, the palmar aneurysms were deemed spontaneous, and of this variety only two cases were found, one[4] that of an ulnar artery aneurysm in a young woman, and one[5] in which the lesion was not palmar but occurred on the dorsum of the hand. Of traumatic aneurysms not resulting from an open wound there were fourteen cases divided into two classes: (1) Acute and due to a single definite contusion, and (2) more delayed and gradual, the result of repeated minor injury.

Of the six cases of the delayed type due to prolonged frequently recurring minor trauma, the injury was incidental to the individual's work and could best be designated as occupational aneurysm. The remainder belonged to the acute form, the result of striking a single sharp blow with the palm of the hand. The time required for the development of these aneurysms ranged from three weeks to five months. To this series Middleton contributed two cases of his own of the occupational variety, one of the ulnar artery in the vicinity of the hamate bone and one of the superficial volar branch of the radial artery. Since Middleton's review several cases have appeared sporadically in the literature, namely, that of Brechot and Reinhold,[7] one by Wapshaw[8] following a midpalmar laceration and developing in twenty-one days to a plum-sized mass, one by Robb, McKetchnie and Guthrie[9] following palmar puncture by glass, a case by McLaughlin,[10] as well as two ulnar and one superficial arch aneurysms reported by Pemberton and Black.[11]

The signs and symptoms of traumatic palmar aneurysms are essentially the same as aneurysms in other regions. However, it must be borne in mind that small, deep-seated lesions may fail to give any of the classical signs and symptoms. One must also remember that with an arterial aneurysm the effects are less complex and confined to the area supplied by the injured artery, whereas an arteriovenous fistula may produce profound effects on the entire circulatory system.[15]

The findings in aneurysm may be briefly mentioned as follows: (1) An expansile pulsating tumor along the course of a vessel; (2) a scar of the preceding injury in the false type of aneurysm; (3) a variable amount of pain depending on the structures compressed by the tumor; (4) an absent or weak pulse distal to the aneurysm with corresponding oscillometric and blood pressure readings; (5) a possible bruit heard over the mass; (6) a possible thrill felt over the mass; and (7) a varying degree of interference with the arterial supply of the part, venous stasis with edema, claudication and ischemic neuritis.

The signs and symptoms enumerated above will aid materially in the diagnosis of the condition. In addition, there are several procedures which may be of considerable aid in both the diagnosis and the treatment: (1) *Compression* proximal to the aneurysm may allay or abolish the pulsation. (2) *Aspiration* with a fine needle of those masses which are suspicious and do not present the classical signs and symptoms. This is most applicable to

small deep-seated aneurysms in which overlying structures may mask the nature of the lesion. It is most embarrassing to

FIG. 1. Showing extent of palmar aneurysm.

the surgeon to incise into an aneurysmal mass when it is not expected. (3) *Arteriography*. This is not only an aid to diagnosis but a valuable adjunct in estimating the size and shape of the mass as well as a means of evaluating the possible technical difficulties to be encountered and the circulation to be excluded by the contemplated operative procedure. (4) Branham's bradycardic reaction, the presence of pulsating veins, and the determination of carbon-dioxide and oxygen contents of veins may serve to differentiate between arteriovenous and arterial aneurysms.

The radical cure of aneurysm elsewhere than in the palm of the hand often requires the interruption of the main arterial supply of the part. In such cases a careful evaluation of the collateral circulation is a pre-requisite before operation can be undertaken. For this, the Moszkowicz-Matas hyperemic test or one of its modifications[14] may be employed, and if there is need for it, the capacity of the secondary channels may be augmented by prolonged intermittent compression of the artery proximal to the aneurysm by means of bands and by reducing the peripheral resistance to the blood flow by means of sympathectomy, a procedure which will enhance the collateral circulation as well as prevent immediate postoperative vasospasm.[16] In the case of palmar aneurysm, however, the vascularity of the part is so great that little apprehension need be felt regarding the adequacy of the circulation after the operative procedure, and methods designed to either test or increase the capacity of secondary channels may be dispensed with. Opposed to the general consensus that surgical intervention be delayed to permit improvement in circulation, Bullock[17] contends that inasmuch as traumatic aneurysm is a clot with a cavity in it, lined by endothelium and connected with a blood vessel, the essential thing is to discover it as early as possible and not wait until the aneurysm develops. Thus, maintains Bullock, many aneurysms can be prevented by early attention to symptoms that are the results of injuries to vessels and by immediate repair. In the case of infected wounds it is advisable to wait for the disappearance of bacteria from the adjacent tissues[15] unless complications arise which demand earlier intervention. Among the most likely developments necessitating earlier surgery are increase in size of the aneurysm causing compression of collateral channels or adjacent nerves, secondary hemorrhage, and injuries to important nerves at the time of the arterial injury.

The goal of all treatment of traumatic aneurysm is its cure with a minimum of disturbance to the blood supply of the tissues beyond the lesion. This is especially significant when one realizes that, in contradistinction to spontaneous aneurysm of degenerative vascular disease which occurs in more elderly individuals, traumatic aneurysm is more prone to occur in young active individuals whose future usefulness will depend on the maintenance of a normal blood supply.

The surgical procedures employed may be briefly enumerated as follows: (1) Excision of the aneurysm with arterial anastomosis; this will depend on the defect to be bridged; (2) obliterative endoaneurysmorraphy with or without proximal

and distal ligation; (3) proximal and distal ligation of the vessel with excision of the aneurysmal sac; (4) restorative endoaneurysmorraphy; (5) proximal ligation; and (6) proximal clamping.

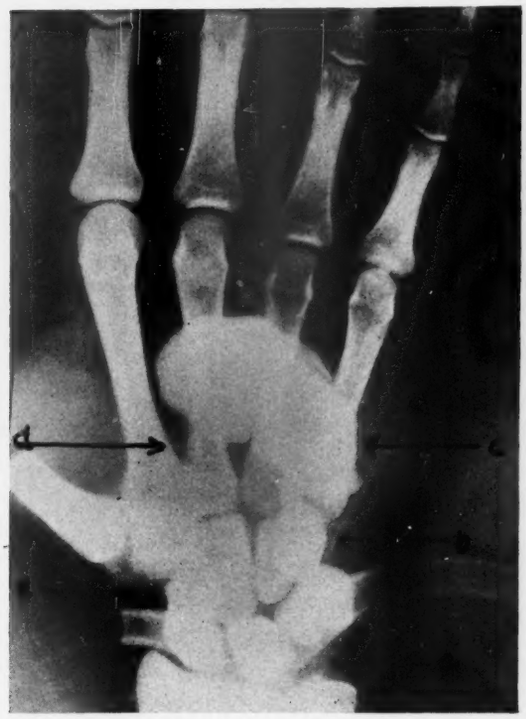

Fig. 2. Arteriogram: *a*, terminal ulnar artery; *b*, fusiform dilatation; *c*, main sac; *d*, superficial volar arch; *e*, radial artery.

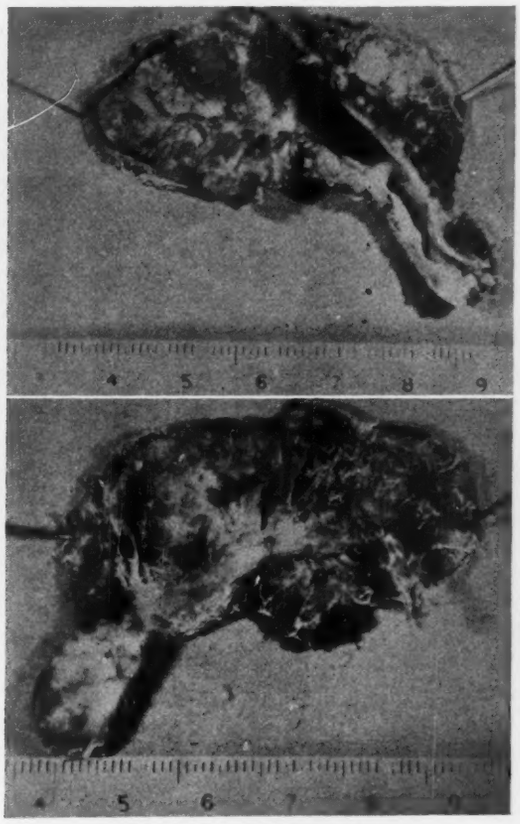

Fig. 3. Anterior view of specimen; compare with arteriogram.
Fig. 4. Posterior view of specimen.

CASE REPORT

The case we are presenting here has a two-fold interest; it falls into that rare category of true acute traumatic palmar aneurysms and exhibits an extremely short time interval for the full development of an aneurysmal sac.

L. S., an eighteen year old soldier, while a passenger in an automobile, was involved in an accident when the car struck a wall on June 18, 1945. The force of the collision threw the soldier against the dashboard of the car causing him to strike the palm of his left hand sharply against a metal protuberance. There was no laceration of the hand and no other injuries except a small scalp laceration. He was taken to a civilian hospital where first-aid treatment was given, following which he returned home. One week later the soldier returned to his army post and reported at sick-call because of a lump which he noticed at the site of the previous injury. A diagnosis of cyst was made and an aspirating needle was inserted into the mass. Fresh blood was removed from the tumefaction. The patient was then sent to the hospital.

Examination on June 26th showed a well nourished, white, young male whose only lesions were a small laceration of the scalp and a large palmar mass. Occupying the medial aspect of the left palm from the wrist to the mid-palm was a pulsating tumor 7.5 cm. by 2.5 cm., expansile, with some ecchymotic spots over its proximal portion. (Fig. 1.) There was no bruit and no thrill. The mass could be emptied by pressure but promptly refilled. The pulsation could be stopped by compression of the ulnar artery at the wrist. Compression of the radial artery produced no change. There was some numbness and diminished sensitivity of the lateral aspect of the little finger and medial side of the ring finger. The blood pressure of the right arm was 116/60 and of the

left arm 114/60. A diagnosis of terminal ulnar and superficial arch aneurysm was made. An arteriogram (Fig. 2) was done to outline the extent of the aneurysmal sac and determine its vascular connections. Under pentothal anesthesia, a small incision was made over the terminal ulnar artery where a small fusiform sacculation was found just distal to the hook of the hamate bone. Ligation of the artery proximal to the dilatation failed to stop the pulsation of the mass. The dissection was continued after enlarging the skin incision into the palm of the hand where a large sac was found continuous with the fusiform sacculation and involving the first portion of the superficial volar arch. The mass was excised with the sacrifice of a minimum amount of the arch.

The pathologist's report on the mass (Figs. 3 and 4) is as follows: The specimen consists of a 1.5 cm. arterial segment, the terminal end of which balloons out into a sac which has a thin wall 1 mm. in thickness. The sac-like portion is 4.5 cm. by 2 cm. by 0.5 cm. Microscopic sections show a stripped and roughened intima with subintimal hyaline degeneration and an edematous muscularis. Acute inflammatory and hemorrhagic foci are scattered in the arterial wall. Diagnosis: (1) Aneurysm-traumatic, (2) arteritis, intramural, acute.

SUMMARY

1. A case of true acute traumatic aneurysm of the palm is presented.

2. The literature on traumatic palmar aneurysm is reviewed and some observations on traumatic aneurysm are made.

REFERENCES

1. Middleton, D. S. *Brit. J. Surg.*, 21: 215–218, 1933.
2. Gage, M. *Am. J. Surg.*, 59: 210–231, 1943.
3. Soupault, R., Gutman, R. A., Rouche, P. and Johill, R. *Presse méd.*, 37: 236, 1929.
4. Griffiths, J. *Brit. M. J.*, 2: 646, 1897.
5. Reid, M. R. *Arch. Surg.*, 12: 1–74, 1926.
6. Matas, R. Quoted by Gage.[2]
7. Brechot and Reinhold. *Progrès méd.*, p. 435, Aug. 12, 1933.
8. Wapshaw, H. *Glasgow M. J.*, 126: 333–335, 1936.
9. Robb, D., McKetchnie, W. R. and Guthrie, D. W. *Australian & N. Zealand J. Surg.*, 12: 147–148, 1942.
10. McLaughlin, C. W., Jr. *U. S. Nav. M. Bull.*, 42: 428–430, 1944.
11. Pemberton, J. de J. and Black, B. M. *Surg., Gynec. & Obst.*, 77: 462–470, 1943.
12. Pratt, G. H. *Surg., Gynec. & Obst.*, 75: 103–109, 1942.
13. Pratt, G. H. *Bull. N. Y. Acad. Med.*, 18: 586–599, 1942.
14. Matas, R. *J. A. M. A.*, 63: 1441–1447, 1914.
15. Bigger, I. A. *Arch. Surg.*, 49: 170–179, 1944.
16. Pemberton, J. de J. *Arch. Surg.*, 49: 179, 1944.
17. Bullock, W. O. *Arch. Surg.*, 49: 179, 1944.

INSPISSATED BLOOD AND THE GROWTH OF FIBROMATOUS UTERINE TUMORS*

PRELIMINARY REPORT

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AT the Southern Sectional Meeting of the American Federation for Clinical Research the author presented his theory of positive chemotropism.[1] This thesis endeavored to explain the origin and growth of fibrous neoplasms by the fact that inspissated blood serum possesses the property of attracting fibroblasts which finally produce these tumors.

To prove this theory, the author described two sets of experiments: The first employed blood serum taken from a "Wassermann-fast" case. Although this particular blood serum was three years old, it produced a small fibromatous tumor on the author's right thigh after this material had been injected intradermally repeatedly. The control site, on the opposite thigh, which received similar injections of saline, remained negative.

The second investigation employed blood serum from the author, and this serum was injected intradermally repeatedly just above the previous experimental site on the author's right thigh. The control site, on the left thigh, which received similar amounts of saline, remained negative.

It was found, upon thorough histological examinations, that the site which was injected with the author's serum, developed a larger fibromatous area than did the area which received the three-year old serum taken from the luetic case.

These histopathological changes demonstrated that these serum injections produced subepithelial changes very similar to those seen in keloids.

In another recent paper, Marshall[2] showed that the tumor section of tissue treated with his serum was twice as dense as the control tissue. This new technic, to determine the ratio of density in tissues, was accomplished with the use of a photographic light exposure meter. This method seems much simpler when compared with the older methods of determining tissue density such as the study of the velocity of fibroplasia or the determination of the tensile strength of tissues.

The purpose of the present study is to carry this tumor study further in order to determine whether or not this same pathological explanation might be applied to the pathogenesis of uterine fibromyomas, commonly termed "uterine fibroids."

ETIOLOGY OF UTERINE FIBROID TUMORS

The etiology of these tumors still remains to be answered fully. Goodwin,[3] among others, has stated that these neoplasms are found most frequently in women between thirty and forty who have not borne children. He stated that old-maid school teachers were particularly susceptible, and that negroes were more susceptible than whites (as is the case with keloids and

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hypertrophic scars). Recently, many investigators have discussed the relationship which is thought to exist between hyperactivity of ovarian secretion and fibroid formation. Some workers think that in undeveloped uteri, certain groups of uterine muscles are activated by the effects from the ovarian hormones and that muscle cells proliferate and become fibroid nodules, especially in areas where the circulation is impaired temporarily. Goodwin observed that fibroids grow only during the menstrual life and remain stationary or atrophy after the menopause.

Kakuschkin[4] thought that these tumors were a pathological reaction to an intensified ovarian stimulation replacing the normal physiological reaction of pregnancy. He reasoned that when pregnancy did not occur, the irritative power of the follicle continued and the regulatory function of the corpus luteum and fetus were absent. Hence, the potential energy of muscular elements of the uterus were manifested abnormally. In other words, Kakuschkin believed that a uterine myoma was the menstrual product of a sterile woman with a high reproductive potency.

Baker[5] called attention to the possibility that endometrial hyperplasia, uterine fibroids, and endometriomas may have a common background. The fundamental cause may be the action of the follicular hormone which acts on the endometrium, the myometrium and the ectopic locations from which the endometrium arises. This follicular action, according to Baker, acts upon the genital tract as a whole. He wrote that the removal of both ovaries results in involution of the uterus, and he believed that a definite relationship exists between ovarian function and the presence of a fibromyoma in the uterus, in the sense that hemorrhages in a fibromyomatous uterus depend upon functional alterations of the ovaries, and vice versa, that the presence of a fibromyoma in the uterus causes alterations in the ovaries. He thought the cause for these uterine tumors may be attributed to some irregularity of function of the anterior pituitary and ovarian hormones which regulate the growth and function of all the pelvic organs. Hence, if this stimulation is sufficiently prolonged, uterine fibroids may be produced, as well as an overgrowth of the uterine endometrium. This viewpoint has been described also by Witherspoon,[6] who found a 10 per cent incidence of salpingitis associated with fibroids in the cases he observed in negro women.

In another paper, Witherspoon[7] mentioned a theory attributed to Sampson. This theory is unique because it suggests a clue to the etiology of uterine fibroids which seems to have been overlooked. Sampson thought that local hyperplasia of uterine muscle cells was caused by the stimulus of menstrual blood which had acquired access to the myometrium by retrograde flow through the venous sinuses of the endometrium. However, no mention was made as to just how this blood produced uterine fibroids. Nor has Sampson's theory been given much credence or prominence in recent writings on this topic.

Goodwin[8] wrote that "cardiac and cardio-vascular changes are frequently associated with fibroids in women, especially if bleeding has been a prominent symptom or if there are extensive degenerations in large tumors. Older pathologists and clinicians held that the factors which produced these changes must be identical with those which caused the tumor, and that a woman with fibroids might be expected to develop cardio-vascular changes sooner or later; this they termed 'fibroid heart.' This theory has never been completely accepted."

These uterine fibromyomas, or fibroids, occur most usually in the interstitial form, according to Boyd.[9] This type of tumor is supplied with blood from the surrounding muscle so that degeneration is rather uncommon. Obviously, these fibromyomas of the uterine fundus have more space in which to grow, once they are formed, in contrast with cervical fibromyomas, which

are relatively uncommon. In the authors' opinion, this may be due to the fact that the cervical tissue is denser and the blood supply is not so marked.

If we remember that these uterine tumors occur only during the reproductive period, we can recognize a correlation with the menstrual mechanism. Sampson's theory, that the local hyperplasia of uterine muscle cells is caused by the stimulus of menstrual blood through a retrograde flow through the venous sinuses, deserves much more attention than it has been given. However, this viewpoint does not explain the origin of the tumor nor its exact pathogenesis.

Furthermore, one should remember that fibroids are found more frequently in colored women. This is true also for the formation of keloids which occur far more frequently in the colored race. In our opinion, the pathogenesis has a similar origin. This is based on the presence of inspissated blood which is forced into the tissue stroma by means of the loss of, or damage to, the endometrium. This may be due to chronic infection, for Witherspoon and Butler[10] found that the negro presented pelvic infections in 100 per cent of the cases which they studied. This infection was not so marked in the white women who were studied, and neither was the incidence of fibroids as marked as it was in the colored race.

The tendency for hemorrhage, either by diapedesis or rhexis, into the uterine fundic stroma, is certainly enhanced by means of the uterine contractions which occur before and during the menstrual periods. These uterine contractions may prove to be an important factor in that they may force the blood deeper into the tissue stroma. Once this blood becomes inspissated, there is cause to believe that it may be the main etiological agent in the formation of these fibromyomas. For inspissated blood serum has been shown by Marshall to possess the ability of attracting fibroblasts to the traumatized area. When the fibroblasts begin to grow, the formation of a fibroid may become a certainty.

Boyd[11] aptly summarizes it this way: "A tumor or neoplasm may be defined as a growth of new cells which proliferate without control and which serve no useful function—the difference between neoplastic and inflammatory conditions is usually easy. In inflammation the causal organisms can be demonstrated, the inflammatory cells which may constitute a lump or mass are varied and pleomorphic, and in the course of time the lesions clear up. In a true neoplasm the cells are usually of the same type (epithelial cells, fibroblasts, etc.) and the condition is progressive. But the matter is not quite so simple. The cells of a tumor may be very pleomorphic (osteogenic sarcoma, glioblastoma multiforme), and on the other hand a chronic inflammatory condition may show marked cellular proliferation as in the hyperplastic form of tuberculosis. Repair, indeed, is just proliferation, and it may be hard to say where the proliferation of repair ends and the proliferation of neoplasia begins. These considerations have a two-fold importance. In the first place they suggest that it may be unwise to draw too strict a line between proliferation and neoplasia, so that there may be borderland conditions such as Hodgkin's disease which partake of the character of both. In the second place, it is possible that the hyperplasia of the chronic inflammation may cross the line and become hyperplasia of tumor growth."

Ewing, according to Moore,[12] has called attention to the close association of small myomas with blood vessels. Ewing observed anomalies and heterotopic tissue in uteri with myomas; hence, he suggested that an anamoly in the formation of blood vessels was a causative factor for the production of these myomas. According to Marshall's theory of positive chemotropism, the diapedesis from injured blood vessels produces an active attraction of fibroblasts to the inspissated blood. When these builders of either repair or tumors arrive in the injured area, an overproduc-

tion of repair tissue may produce the so-called uterine fibroid.

There is a striking clinical correlation which we wish to report. We all are acquainted with the classical experiments which employed estrogenic hormones placed in tablet form under the skin of guinea-pigs. Apparently this procedure produced uterine fibromyomas in these animals.[13] These tumors ceased to grow and retrogressed when the hormone ceased to act. The correlation is that humans, treated with estrogenic hormones, have developed acne vulgaris (Hamilton).

In the case of guinea pigs, an increased blood supply to the uteri may have produced minute hemorrhages which would, as we have mentioned, attract fibroblasts, which in turn would produce fibroids. When acne in humans was produced through the use of the estrogenic substance, an increased blood supply to the skin could have been observed, as it is in most cases of acne. Here again, inspissated serum can attract fibroblasts with the result that the patients may develop hypertrophic scars or keloids. This correlation becomes all the more striking when we remember that hypertrophic scars and keloids are not too far removed pathologically from uterine fibromas.

A review of the literature on this subject would not be representative unless the work of the Englishman, Robert Bell,[14] were mentioned. Bell thought that uterine fibroids and also mammary adenomas were caused by bleeding from the tissue capillaries. This effusion of blood in diseased tissue (for Bell was of the opinion that such a uterus also exhibited metritis) caused a blood clot which formed a vascular connection with its environment and began to grow after the blood clot became organized. Thus the uterine fibroid came into being, according to Bell.

This last reference, is of particular interest to the authors, since Bell recognized the fact that infection and the marked blood supply of the uterus predisposed it to hemorrhage. Our theory differs with his in that he thought that the organized blood clot actually formed the uterine fibroid, while our opinion has it that this inspissated blood attracts the fibroblasts which begin to lay down an overabundance of fibroblastic repair tissue, and this forms the uterine fibroid.

In our haste to formulate theories, which we think are promising, we tend to overlook the concise and logical thinking of our predecessors, men who accomplished so much with so little scientific equipment with which to work. It was the great Englishman, Abernathy (1825)[15] who wrote: "If, then, the coagulable part of the blood be from any cause effused, if the adjacent absorbents do not remove it, and the surrounding vessels grow into it, the origin of a tumor may be thus formed. It may be right to repeat a little on the causes which may occasion a deposition and consequent organization of the coagulable part of the blood; as such reflections throw light on the nature and growth of tumors, and lead to the establishment of principles, which are applicable to tumors in general. The deposition of the coagulable part of the blood may be the effect of accident, or of a common inflammatory process, or it may be the consequence of some diseased action of the surounding vessels which may influence the organization and growth of tumors."

AUTHORS' PRELIMINARY EXPPRIMENT ON DOG

On September 18, 1945, a six months old dog was prepared surgically and was given nembutal anesthesia. The abdomen was opened routinely and the left horn of the uterus was injected with saline solution. The right horn of the uterus was to be injected with whole blood from the dog. Fine hypodermic needles were employed for both injections, and it was not a certainty that we succeeded in injecting the dog's blood into the right horn. The dog's horns were about 2 mm. in diameter, and extreme care was taken not to injure

these tissues. The abdomen was closed routinely, and the puppy was returned home after ten days. A few days later, the dog began to cough and grind her teeth, and she was returned to the hospital where a diagnosis of pneumonia and encephalitis (probably due to a virus) was made. She made an uneventful recovery except that she showed athetoid movements, such as snapping her jaws and puffing her cheeks. These were especially evident whenever she became excited.

Both uterine horns were removed on November 21, 1945, under nembutal and magnesium sulfate anesthesia. These tissues were placed in separate labelled vials, which contained 10 per cent formalin, and these were sent to Dr. Rosenthal for microscopic examinations. Gross examination of tissues revealed that no changes were evident in either horn.

COMMENT

We do not believe that we made a satisfactory injection of whole blood into the uterine horn, since we experienced much difficulty with obtaining blood from the vein for the injection and the blood may have coagulated. Extreme care, in injecting these horns was exercised, since these tissues were very delicate and thin.

We are now making arrangements to repeat this procedure on an older dog. We plan to use an animal who has whelped at least one litter of puppies, since the uterine horns of such an animal are larger and thicker. This, of course, will render these tissues easier to inject with saline and also whole blood.

If this procedure can be accomplished satisfactorily, we believe that we have a much better chance to develop a uterine fibroid in the dog's horn from the injected blood. Should this come about, we will have definite data as to the formation of uterine fibroids, and the pathogenesis could be explained readily by the theory of positive chemotropism.

SUMMARY

In this communication, we have reviewed Marshall's theory of active chemotropism which, we believe, offers a rational explanation for the process of fibromatosis. We have reviewed these experiments in which he succeeded in producing two fibromatous lesions on his thighs. Sections of the tumors were verified pathologically by an independent pathologist.

Attention has been called to the rôle of inspissated blood as an important etiological factor which attracts fibroblasts to the injured area. An overproduction of fibroblastic tissue produces the overgrowth of this tissue or, in other words, a tumor.

Our present concept, then, as to the etiology of uterine fibroids, is that infection of this tissue predisposes to hemorrhage, which is intensified by the presence of menstrual blood during the monthly periods. The contraction of the uterus tends to drive this blood deeper into the tissue stroma.

If this inspissated blood remains for a certain length of time, a chemotropic response occurs which attracts fibroblasts to this area of injury. The "piling up" of fibroblasts, or fibroplasia, produces the uterine fibroid. If the same phenomenon occurs in other parts of the uterus, the growths may become multiple and may be expected to occur wherever the uterine blood pools have become inspissated. Obviously, the tendency for this chain of events is lessened markedly if the patient does not menstruate for one reason or another. If infection is absent, the chance for hemorrhage is lessened also.

We have reviewed the views of other investigators in relation to the production of uterine fibroids. We believe that the theory of positive chemotropism may be shown to play a major part in the etiology of such tumors, and may be demonstrated at a later time through the experiment which we have described.

We have described our first attempt to produce a uterine tumor in a female

puppy with the use of Marshall's technic. Our present failure is thought to be due to the fact that serious difficulty was met when the whole blood was inadequately introduced into the extremely delicate uterine horn.

We have described our current research attempts with the hope that other investigators, who have access to limitless material and equipment, will run their series of experiments independently to determine their own findings with our method for the production of fibromatosis in the uterus of dogs or other suitable animals.

REFERENCES

1. Marshall, W. Fibromatous skin lesions produced by repeated blood serum injections in the human. *Am. J. Surg.*, 69: 338–343, 1945.
2. Marshall, W. Further data on the pathogenesis of fibroblastic neoplasms; density ratio of tissue computed by the author's exposure meter method. *J. M A. Ala.*, 15: 206, 1946.
3. Goodwin, R. T. Fibromyomata of uterus. *Texas State J. Med.*, 33: 748, 1938.
4. Kakuschkin, N. The etiology and prophylaxis of myoma of the uterus. *Zentralbl. f. Gynäk.*, 54: 2899, 1930.
5. Baker, E. M. The relationship of ovarian function to uterine fibroids. *Pennsylvania M. J.*, 48: 29, 1944.
6. Witherspoon, J. T. Possible cause of uterine fibroids. *Endocrinology*, 17: 703, 1933.
7. Witherspoon, J. T. The interrelationship between ovarian follicle cysts, hyperplasia of the endometrium, and fibromyomata; a possible etiology of uterine fibroids. *Surg., Gynec. & Obst.*, 56: 1026, 1933.
8. Goodwin, R. T. Op. cit.
9. Boyd, W. A Textbook of Pathology. 4th ed., p. 664. Philadelphia, 1943. Lea and Febiger.
10. Witherspoon, J. T. and Butler, V. Etiology of uterine fibroids with especial reference to frequency of their occurrence in the negro: a hypothesis. *Surg., Gynec. & Obst.*, 58: 57, 1934.
11. Boyd. Op. cit., page 247.
12. Moore, R. A. A Textbook of Pathology. P. 1145. Philadelphia, 1944. W. B. Saunders Co.
13. Boyd. Op. cit., page 663.
14. Bell, Robert. Pathogenesis of uterine fibroids and mammary adenomata. *Med. Press, London*, pp. 249–251, Sept. 24, 1924.
15. Abernathy, J. The Surgical and Physiological Works. Vol. 2, p. 69. Hartford, 1825. Oliver D. Cooke & Co.

VARICOSITIES OF THE LOWER EXTREMITY

DESCRIPTION OF AN IMPROVED METHOD OF TESTING FOR INCOMPETENT COMMUNICATING VEINS

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THE subject of varicose veins has been clouded by a great deal of conflicting opinion as to proper treatment and by the introduction of tests which fall short of their acclaimed value. One school of thought leans toward over-simplification of the problem while another will produce chaos by applying every test, whether it is applicable or not, to each case. This is a reflection on our proper understanding of basic anatomical and physiological considerations. For purposes of clarity it is convenient to eliminate the names which have been applied to various tests and to state in basic terms the fundamental anatomic considerations and a basic method of discovering what disturbance of physiology is present in the case under study.

The basic considerations may be stated simply:

1. Do the varicosities involve the greater or lesser saphenous system? If they involve the greater system, testing will be carried out from the groin to the ankle. If they involve the lesser system, testing will be carried out from the popliteal space to the ankle. If both systems are involved, the testing must be separated for each system.

2. Are the valves in the superficial veins incompetent? The value of discovering this abnormality has been grossly overrated. It may be accepted as firm fact, based on elementary physics, that if a vein is dilated, its valves are incompetent. This is so because any valve system designed originally to take care of back flow in a normal-sized vein will fall short of its job, either wholly or in part, when that vein increases its caliber. Whether or not the incompetency of the valves in any system of veins can be demonstrated clinically, the incompetency had best be considered as present when the veins are varicose.

3. Is the deep circulation patent? After application of a tourniquet at the point of entrance of the main saphenous trunks into the deep circulation (upper thigh for great saphenous and just below the knee for lesser saphenous) with the veins distended the patient is allowed to walk a few steps. If the veins become less tense, the deep circulation is patent. The application of a tight ACE bandage followed by walking some distance as a test for patency of the

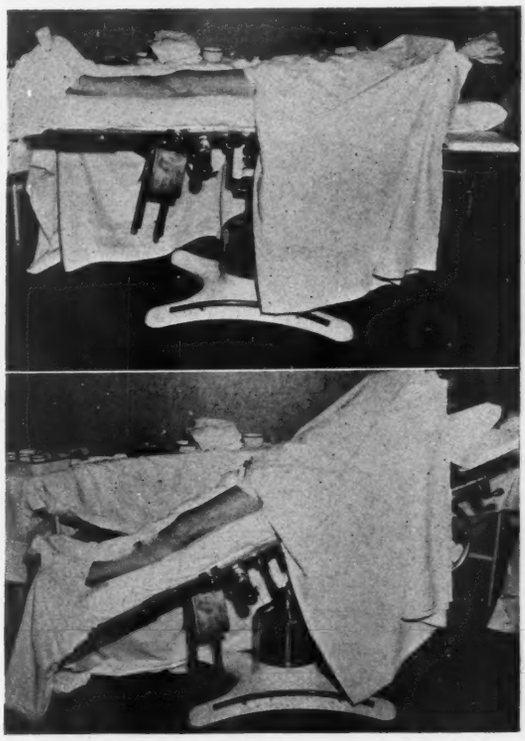

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FIG. 1. Demonstrates full leg exposure and draping with foot board in place on the table. The latter will allow for tilting of the table and assumption of a near erect position.

FIG. 2. Table tilted toward erect position which allows for execution of clinical tests for venous pathological conditions.

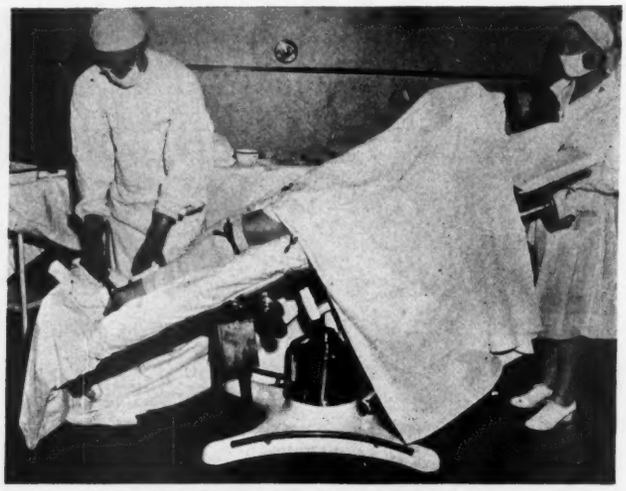

FIG. 3. Tourniquets and bandage are in place for determination of sights of perforators by conventional methods. The patient can be placed in the Trendelenburg position before application of tourniquets or bandage.

FIG. 4.

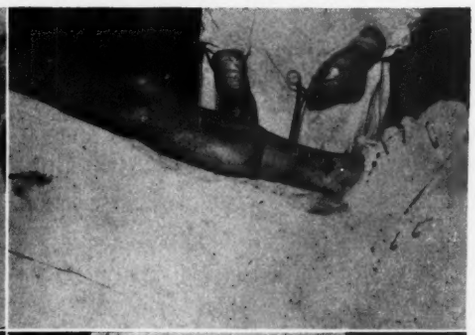

FIG. 5.

FIG. 6.

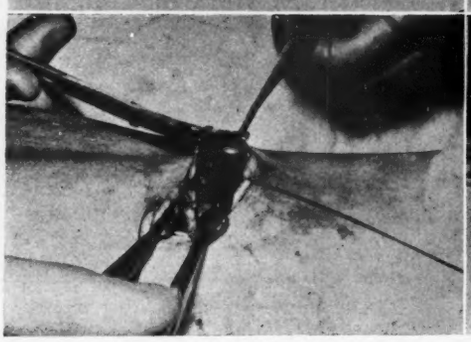

FIG. 7.

FIG. 4. Demonstrates distention of veins when patient is put in the reverse Trendelenburg position. At the point marked "X" a large perforation is almost invariably found.

FIG. 5. Improved technic for determination of exit of incompetent perforators. The tourniquet is advanced from below upward on the lower extremity. At the points where perforators are suspected, the vein is exposed and severed between clamps. The perforator, if it is found, is treated in the same manner. Preliminary testing may be carried out by the application of two tourniquets at short distances from each other while the Trendelenburg position is assumed, followed by assumption of the reverse Trendelenburg position. However, it is believed that the ligation as illustrated acts in a more effective manner than the lower tourniquet in stopping confusing flow from the distal points of the vein. The clamp is pointing to a spot of dilatation in the vein where a perforator is suspected.

FIG. 6. Demonstrates the incompetent perforator found at the point determined in Figure 5 at the point of the clamp. The trunk of the internal saphenous system has been clamped. The perforator can be seen entering the fascia of the leg and the saphenous trunk.

FIG. 7. Illustrates points at which the saphenous trunk has been exposed. At all of these points the presence of perforators was suspected.

deep circulation is based on subjective manifestations and is liable to fallacious interpretation. Venographic study is only occasionally necessary in these cases.

4. Are the communicating veins or "perforators" incompetent and, if so, where are they located? Recently great and proper emphasis has been placed on this feature of the pathology of varicosities. Several tests have appeared in the literature for determining the location of these abnormal communicating veins. Anyone who will subject these tests to careful analysis will realize that they are not altogether accurate. We discovered early in the use of these tests (with ACE bandage removed from below upward and with serial application of two tourniquets) that we were able to detect areas of bulging distal to the ACE bandage or between the two tourniquets, but that upon exposing the vein by incision over these points the perforator was not always there. We had merely discovered the point of maximum dilatation of the vein, subject to filling from the perforator, in the area between the two tourniquets. It might be found at a point some distance, medial or lateral, from the area of filling determined preoperatively. We believed that it was essential to develop some method by which perforators might be discovered as the operation progressed in order to overcome the shortcomings of tests for perforators carried out preoperatively. The method of employing vein strippers for the location of perforators leads to improper conclusions, particularly when used below the knee. Lateral branches as well as perforators will obstruct the passage of the stripper loop. The method of performing the necessary calisthenics for testing is described in the legends to the illustrations. We believe that this method is a valuable aid to this important phase of the operative treatment of varicose veins.

It is to be emphasized that the extreme reverse Trendelenburg position should be assumed and maintained for five to ten minutes after all ligations are completed. If dilatation of any of the veins becomes manifest, it may be assumed that an incompetent perforator has been overlooked and further search is in order. Careful attention to details of interpretation will obviate the likelihood of overlooking perforators as the operation progresses.

FIG. 8. FIG. 9.

FIG. 8. Demonstrates healed wounds eight days postoperatively. The incision over the saphenofemoral junction will be noted. The classical ligation at this point is done in all cases in which varicosities involving the internal saphenous system are demonstrated in the thigh.

FIG. 9. This venogram demonstrates the fallacy of our conventional tests for the presence of perforators. The venogram was made by the method of Mahorner with the addition of pressure over the femoral vein just below the inguinal ligament. This pressure produced a flow of the diodrast from the deep circulation to the superficial through the incompetent perforator shown at "X." By clinical tests the major bulge in the vein between the two tourniquets had been found at "Y" about two inches distant.

A FURTHER STUDY OF EARLY POSTOPERATIVE AMBULATION

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MANY new surgical technics and procedures, having been tried and found worthy, do not win general acceptance by the profession, due to a hesitancy to "try something new and radical." One such radical technic is the permitting of patients to rise and walk early after operation, disregarding the long period of bed rest which has become traditional. However, early mobilization after operation is not new. McDowell,[1] in reporting three cases of extirpation of diseased ovaries in December, 1809, reported on a woman who rose early without the doctor's orders, but also without mishap: "In five days I visited her, and much to my astonishment, found her engaged in making up her bed. I gave her particular caution for the future; and in twenty-five days she returned home as she came, in good health, which she continues to enjoy."

Leithauser,[2] an enthusiastic supporter of early mobilization after operation, reviewed the literature on the subject, saying that Ries,[3] in 1899, routinely allowed his patients to rise early. In the late twenties many foreigners adopted the practice, reporting some 15,000 cases, among which were included Zava's[4] 6,000 cases without pulmonary emboli or eventration.

In this country reports on early rising did not become prevalent until more recent years, but now reports are multiplying with large numbers of cases cited. Some of the more recent advocates of this mode of treatment are Leithauser,[5] Nelson,[6] Fisher and Burch,[7] D'Ingianni,[8] and Patricelli.[9]

Since prolonged bed rest after operation has become an established practice, let us examine the reasons for such a practice. It has been generally supposed that wounds heal more rapidly when the patient is immobilized, and does not tear and pull at the suturing through exertion. The resting patient, it is believed, conserves his energy and allows his body to rebuild its injuries received through operation and previous illness. Finally, pulmonary emboli, which form about the third day, have time to dissolve during the long period of rest in bed.

On the other side of the story, the advocates of early mobilization claim that the value of prolonged bed rest during convalescence after operation is overestimated; indeed, that it is often detrimental to the well being of the individual to remain immobilized; that wound healing is actually retarded when circulation is slowed through inactivity.

Kimbarovskiy[10] immobilized a group of dogs in plaster casts after operation, and allowed another group, similarly operated upon, to move about freely. He found the tensile strength of the wounds greater among those that moved about unrestrained. Newburger,[11] experimenting with rats, obtained similar results. Nelson,[12] reporting on children, and Zava[13] reporting on mentally deficient patients, found their wounds healed as well, if not better, than the wounds of patients who cooperated by resting quietly for the prescribed period.

Fisher and Burch[14] reported 1,494 cases of acute appendicitis in which the patients were allowed up to void eight hours after operation, and who were ambulant on the fourth day. The absence of phlebothrombosis and pulmonary emboli were pointed out; they found no interference with wound healing, and noted the early restoration of normal pulmonary and intestinal function. The patients were enthusiastic and exhibited no great discomfort because of their early activity.

The following report of 250 personally supervised cases of early mobilization are to be added to my recent report which included 153 cases. Of these 250 cases, ten were patients who were operated upon for cholecystectomy, ninety-five rose early after appendectomy, and 145, after laporotomies. The following table briefs the bedside notes of their stay in the hospital:

AVERAGE VALUES	
No. of days in hospital	5.8
Increase in temp., degrees F	1.9
No. of days fever persisted	2.1
No. of complications	0.02
Postoperative day diet was ordered	1.6
No. of hypodermic injections of narcotics	3.8
No. of catherterizations	0.03
No. of patients discharged with fever	0.0
No. of patients with chromic gut sutures	95.0
No. of patients with cotton sutures	155.0

This briefly summarized report conforms more closely to the reports of other advocates of early mobilization than did my earlier comparative report of 153 cases, largely because of the great reduction in the number of complications, in the duration of fever, and in the number of injections of a narcotic that were necessary.

The complications among the group herein reported were confined to one case of wound infection, which persisted until all of the cotton sutures placed in the fascia had been removed; two patients who developed persistent nausea and vomiting, which were relieved only by an indwelling duodenal tube; one who developed cystitis following a vaginal hysterectomy; and one patient who developed bronchitis. The number of severe complications that were encountered in the earlier report were not present in this group of 250 cases.

The number of injections of narcotics administered by hypodermic was extremely few, many patients required only one injection postoperatively, and the average was 3.8.

Although 250 cases added to 153 cases previously reviewed are not staggering figures as far as statistics go, and can in no manner compare with Zava's 6,000 cases, yet they become significant because they so consistently point out the advantages of early mobilization.

A prompt return to normal life after operation, without undue upset of normal body functions should be the aim and end of all surgical procedure. If increasingly more advocates of early mobilization report continued excellent results over a period of years, perhaps the tradition of prolonged rest in bed after operation may one day find itself shelved.

REFERENCES

1. McDowell, Ephraim. (Cited by Haggard, Wm. Surgeon of the wilderness. *Surg., Gynec. & Obst.*, Feb., 1934.)
2. Leithauser, D. J. Confinement to bed for only twenty-four hours after operation. *Arch. Surg.*, 47: 203, 1943. Leithauser, D. J., and Bergo, H. L. Early rising and ambulatory activity after operation., Ibid., 42: 1086, 1941.
3. Ries, E. Some radical changes in after-treatment of celiotomy cases. *J. A. M. A.*, 33: 454, 1899.
4. Zava, L. The advantages of early rising after operations. *Policlinico (sez. prat.)*, 47: 865, 1940.
5. Leithauser, D. J.[2]
6. Nelson, H. Early ambulation following section of the anterior abdominal wall. *Arch. Surg.* 49: 1, 1944.
7. Fisher, H. and Burch, J. The treatment of acute appendicitis. *South. M. J.*, 38: 255, 1945.
8. D'Ingianni, V. Early and late postoperative ambulation (a comparative study of 303 cases). *Arch. Surg.*, 50: 214, 1945.
9. Patricelli, L. Results of early rising following appendectomies, *Northwest. Med.*, 44: 54, 1945.
10. Kimbarovskiy, M. Early rising and healing of postoperative wounds. *Novyi Khir. Arkhiv.*, 48: 116, 1940.
11. Newburger, B. Early postoperative walking (the influence of exercise on wound healing in rats). *Surgery*, 13: 692, 1943.
12. Nelson, H.[6]
13. Zava, L.[4]
14. Fisher, H. and Burch, J.[7]

DIRECT INGUINAL HERNIA

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DIRECT inguinal hernia can truly be considered the bête noir of all hernias, because of its etiological factors, rate of recurrences and unsatisfactory treatment. Even its designation as direct is ambiguous and illogical. Abdominal contents do not enter the hernial sac any more directly than those of the indirect variety in which the sac is already preformed and the neck open and inviting. The term, hernia into Hesselbach's triangle, is more significant but introduces the undesirability of a proper name whose significance may be non-informative to many. Hernia into or of the inguinal triangle is offered as a suggestion.

Compared to the indirect variety the etiological factors are really paradoxical. While the deep ring has much more ample protection by the trap door valve of the internal oblique muscle, reinforced by a firm fascia of the external oblique muscle, the caudad portion of the inguinal canal has as its sole support an attenuated transversalis fascia and skin. Still the former variety is four times more common. As these hernias are always acquired they appear only in adult life, usually in the fourth to the sixth decade. It can thus be assumed that this apparently weak area is nevertheless capable of withstanding the strain and stress of physical effort and increased intra-abdominal pressure for the major part of one's life. But to confound the problem further is the fact that recurrent hernias reverse the ratio of primary indirect to direct type.

SURGICAL ANATOMY

The triangle through which the sac protrudes or bulges is bounded by the epigastric vessels, Poupart's ligament and the edge of the rectus muscle. It may be of different dimensions, the larger ones being more liable to be the seat of a hernia. The internal oblique muscle and the transversalis fascia are the tissues subject to most variations. The further away from the anterior superior spine the muscle takes its origin, the less protection it can offer as it contracts and straightens out its curving fibers to cover the canal; and if its tendon together with that of the transversalis muscle is inserted into the sheath of the rectus instead of the pubic spine, it removes additional support at the lowest angle. The muscle may be deficient in structure and therefore in contractility owing to the component muscle bundles being banded rather than in a uniform plate. Undoubtedly chronic wasting diseases may cause a deterioration.

The transversalis fascia may present a definite opening or defect, a bulge or attenuation or appear entirely absent. However, it is always present posteriorly and medially to the internal oblique muscle, even though it may be necessary to remove the overlying areolar tissues to identify it.

The sac, whether a saccule or bulge, may be peritoneum, bladder or bladder diverticulum or large bowel. If associated with considerable preperitoneal fat, it is suggestive of bladder tissue. But this is not to be confounded with the so-called gland of Rosenmuller which is merely a collection of isolated adipose tissue. In the case of the definite opening in the transversalis fascia, the protruding tissues may be incarcerated or even strangulated.

The peritoneum lining the anterior inferior medial abdomen has three definite fossae formed by the urachus in the mid line, the deep epigastric vessels laterally and the obliterated hypogastric vessel

between. The middle fossa is the seat for the direct hernia.

DIAGNOSIS

The diagnosis depends upon the perception of a protruding reducible mass through the superficial ring on increased intra-abdominal pressure. A mere impulse or the presence of a large ring does not constitute a hernia nor does it denote the potentiality of one. If the tip of the finger, inserted within the ring, with the palmar surface directed posteriorly, feels the mass on the ball, the hernia is of the direct variety; if on the tip, the hernia is the indirect form. A direct hernia never descends into the scrotum. On the other hand both may be and often are associated.

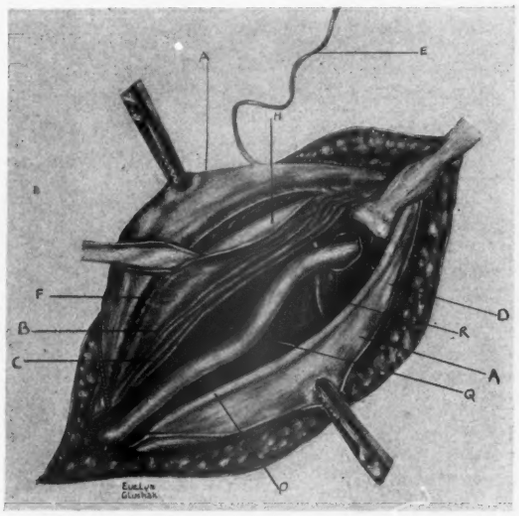

FIG. 1. A, aponeurosis external oblique muscle; B, internal oblique muscle; C, suture; E, epigastric vessel; F, cut edge of fascia internal oblique muscle; H, lateral leaf of cut internal oblique fascia; P, Poupart's ligament; I, transversalis fascia; R, incision transversalis fascia; S, uncut peritoneum.

DIFFERENTIAL DIAGNOSIS

Femoral Hernia. While the uncomplicated femoral hernia should offer no difficulty, inasmuch as it emerges below the line running from the anterior superior spine to the pubic spine, the incarcerated one if sufficiently large almost always is directed upward to occupy the inguinal region, even though the bulk of it is below. However, as the incision over the femoral region can readily expose the superficial inguinal ring the correct diagnosis can easily be made.

Cyst of the Cord. Usually there is an absence of any general discomfort, abdominal symptoms or local pain. The tumor is rounded, partially movable but not reducible into the abdomen.

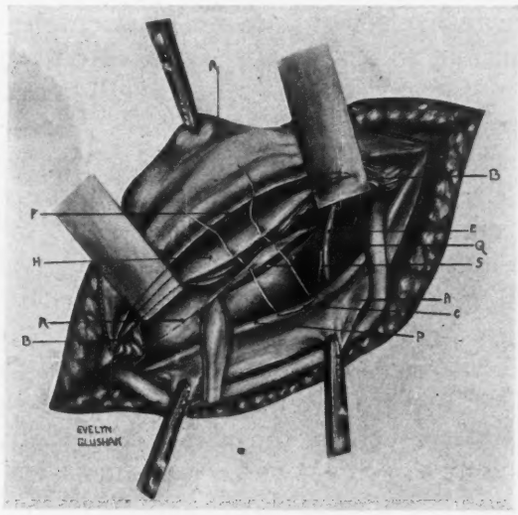

FIG. 2. A, aponeurosis external oblique muscle; B, internal oblique muscle retracted so as to show line of incision in transversalis fascia; C, mattress suture through flap of internal oblique aponeurosis, flap of transversalis fascia and Poupart's ligament; E, deep epigastric vessels; F, incision of aponeurosis internal oblique muscle; H, flap of internal oblique aponeurosis; P, Poupart's ligament; Q, transversalis fascia; R, incision in transversalis fascia over bulge of hernia; S, uncut peritoneum.

TREATMENT

The essential factors are (1) elimination of the cause if possible such as laborious occupation in a man over fifty, large abdominal tumor, ascites, etc; (2) adequate reinforcement by the use of homologous tissues; (3) good exposure at the pubic spine, avoidance of trauma, tension, oozing or infection; (4) utilization of the trap-door action of the internal oblique muscle.

Some of the fallacies of operative procedures are: (1) Using the same technic for the indirect as for the direct variety. (2) suturing the internal oblique muscle to

Poupart's ligament. It is not the author's intention to take up the old and oft repeated discussion of the union between muscle and fascial tissues, irrespective of the type of suture material. It is enough to state that in every case of recurrence it is noted that some part of the muscle has torn away from Poupart's ligament. It is plausible to expect this as repeated muscular contraction will tend to pull it away from its unnatural attachment. Furthermore, the normal and important trap-door closure action of the internal oblique muscle is thus entirely eliminated; and if and when the muscle is partially or completely freed from Poupart's ligament, it is weaker from disuse and atrophy than before operation and therefore invites a recurrence often larger than the primary hernia. The suture and attachment of the conjoined tendon to Poupart's ligament or Cooper's ligament is equally fallacious. These are all fixed structures and to approximate them necessitates tension, an egregious sin of any plastic operation. In a recent article this point is inadvertently mentioned by the author in advocating the use of heavy silk for approximating the tissues under tension, but any suture will cut through if the tension is excessive.

Author's Technic. The incision extends from the anterior superior spine almost to the pubic spine. It will be noted that this is longer than the usual Bassini incision but it is essential for good exposure at the lower angle and of the internal oblique aponeurosis. Hemostasis must be complete and separation and isolation of the structures must be by sharp and not blunt dissection, thus assuring a minimum of trauma. Intimate anatomical knowledge is a *sine qua non.* As the vascular supply of the aponeurosis is largely through the subcutaneous layer, it is advisable not to separate the latter widely to either side of the incision. After splitting the external oblique aponeurosis, avoiding injury to the ilio-inguinal and hypogastric nerves, Poupart's ligament is amply exposed laterally and the internal oblique fascia medially. Upon splitting the cremasteric fascia longitudinally, the presence or absence of an indirect sac is determined. If even a small one is found, the peritoneum is freed and traction made thus pulling up the direct sac through the deep ring, opened, tied and excess resected. With good medial retraction of the internal oblique muscle, the areolar tissue overlying the transversalis fascia is removed, the latter grasped and cut obliquely. The internal oblique fascia is then cut at and parallel to its fusion with the external aponeurosis and a flap developed and turned laterally to be sutured to Poupart's ligament together with the cut edge of the transversalis fascia. In some cases especially obese ones, it is easier to make two separate layers of suture to Poupart's ligament. Mattress sutures are used as they give a wider apposition.

TABLE 1
STATISTICS

	Direct Hernias	Direct Indirect Hernias
Total number	72	21
Not followed up	9	2
Less than one year since operation	4 13	
	59	19
Recurrences	5*	1†
Recurrence percentage	8.4	5.2
Suture Material		
Fascia	23	5
Chromic No. 2	6	3
Chromic No. oo	7	4
Silk	21	7
Not specified	0	2
Cord transplantation		
Subcutaneous	22	4
Subaponeurotic	23	11
Infection (fascial suture)	1	0
Age		
20–29	6	2
30–39	18	2
40–49	15	8
50–59	12	3
60 and over	3	4

* All fascial sutures.

† Age forty-five, recurred in three months, cord not transplanted, suture material chromic No. 2.

Suture material, I believe, is of relatively minor importance, four series having been followed, using fascial sutures from the external oblique aponeurosis, fascia lata, silk and fine chromic No. 00. Tissues heal by traumatic inflammatory reaction followed by fibroblastic infiltration and ending in firm fibrous union. The only function of the sutures is to hold the flaps in contact during the lag period. It is desirable that the early inflammatory reaction be of the mildest type, such as is produced by chronic No. 00, very fine silk and alloy steel. A fascial suture fashioned from the external oblique aponeurosis or fascia lata and merely attached by a quarter of an inch at one extremity is to all intents and purposes devoid of its blood supply. When in addition it is woven into the tissues and subjected to trauma and tension, it must lose its viability. It therefore acts as a foreign, dead body even though it be autogenous and homologous. Clinically, this is borne out by the greater tissue reaction that takes place. In this series the largest number of recurrences have occurred with the use of fascia.

CONCLUSIONS

1. Etiological and mechanical factors involved are still poorly understood.

2. Intimate knowledge of anatomical variations is essential.

3. Application of logical, surgical principles rather than stressing the importance of details, such as suture material, will eventuate in a higher percentage of cures.

REFERENCES

ZIMMERMAN, L. M. et al. Ventral hernia; banding abdominal muscles. *Surg., Gynec. & Obst.*, 78: 535, 1944.

CARNES, E. H. Direct inguinal hernia-fascial repair. *Surg., Gynec. & Obst.*, 69: 247, 1939.

ANDREWS, E. and BISSELL, A. D. A record of surgical failures. *Surg., Gynec. & Obst.*, 58: 753–761, 1934.

STEIN, H. E. Inguinal hernioplasty; a new concept and operation. *Am. J. Surg.*, 56: 480, 1942.

STEIN, H. E. Changing concepts of inguinal hernia. *Am. J. Surg.*, 46: 88–91, 1944.

STEIN, H. E. and CASTEN, D. A study of recurrences following inguinal hernioplasty. *Surgery*, 14: 819, 1943.

RELIEF OF PAIN IN OSTEOARTHRITIS OF THE HIP JOINT

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OSTEOARTHRITIS of the hip joint is a degenerative lesion, the etiology of which is not clearly understood. Its development has been attributed to various factors, as have osteoarthritic processes in other joints. Among these are, metabolic changes, infection, trauma, epiphyseal disturbances and congenital luxation without actual dislocation.

Briefly, the pathology consists of diminution of joint space and slight flattening of the head of the femur; proliferation of new bone around the head of the femur and margin of the acetabulum; the cartilage becomes worn over the head and in the acetabulum and is replaced by hard eburnated bone and the acetabulum grows larger as the head flattens, the femoral neck becoming short and broad.

X-ray findings show that in the early stages there is usually marginal spur formation, slight sclerosis of the opposing articular surface and slight narrowing of the joint space. In advanced cases the articular cartilages may be destroyed so that the eburnated bony articular surfaces are practically in contact; subarticular cystic changes and slight to moderate sclerosis of the intervening bone are often noted; marginal spur formation is more prominent.

Symptoms. The patient develops pain and stiffness of the hip joint and walks with a limp. The degree of pain is not necessarily in proportion to the amount of damage to the joint. Some patients with only minor damage may suffer severely, and others with marked destructive changes may have little pain.

The pain may be localized to the region of the hip joint, or more often it is referred to the lower portion of the extremity, to the knee or to a lower point, on the anterior surface of the leg, or lateral calf, the pathway of pain often simulating the pain of sciatic distribution.

This pain is purely reflex, being an intrasegmental reference from the painful stimuli arising in the structures about the hip joint. As in all cases of reflex pain arising from somatic structures, the area of pain reference has no tenderness of recognizable pattern and more often has no tenderness. Atrophy of the leg muscles is from disuse only. Sensory changes or alterations of reflexes in the area of pain reference are not present.

Observation to date, we believe, allows us to express the view that in many instances of severe pain arising from the lesion of an osteoarthritic hip joint, the pain does not come from the destroyed portions of the joint but from the periarticular structures which have had undue stress and strain and alteration of function placed upon them as a result of displacement of the bony supports. In addition a low grade inflammatory reaction may be superimposed.

The structures which appear to be responsible for pain in most of these cases are the tendons of the gluteus minimus, gluteus medius, and perhaps, the pyriformis. In most instances deep pressure over the tendons causes severe pain. These structures are most often responsible when the pain radiates to the calf.

We have been able, on repeated occasions, to relieve severe pain of short or long duration in osteoarthritis of the hip joint by conservative treatment consisting of a local infiltration of procaine hydrochloride.

Not all patients with osteoarthritis of the hip joint are benefited by this form of therapy. Only those patients exhibiting tenderness above and behind the trochanter should be infiltrated.

In order to determine whether or not an injection should be attempted, the patient is placed upon the examining table with

the painful hip up and the back toward the examiner. The thigh is flexed upon the abdomen to about 70 degrees. Above the trochanter, using deep pressure the tense and painful tendons can be palpated. From before backwards the gluteus minimus and the gluteus medius tendons can be felt. The pyriformis insertion lies behind and below the top of the trochanter. At times the tensor fascia femoris anteriorly is tense and tender.

With the tender points marked, a 3 inch No. 22 gauge needle is inserted through a skin wheal, and 5 cc. of 1 or 2 per cent procaine hydrochloride is deposited at a depth which varies from 1 to 2½ inches. Pressure or needling at the time of infiltration may cause the typical reflex radiation of which the patient complains. If no tenderness is present as compared to the opposite of unaffected side, injection is usually of no benefit. The injection may be repeated every fifth day.

Such cases of tendinitis occur also in the absence of an osteoarthritis of the hip and, because of the distribution of the reflex radiation into the leg, may at times, be mistaken for sciatic pain.

The progress of the joint disease, of course, is not affected by this procedure, but the results in many instances have been so satisfactory that the method appears to be of value solely for the purpose of relieving the pain.

It is possible for osteoarthritis to simulate protruded intervertebral disk; at times it may comprise a part of the general picture when a disk is present.

From "Surgical Treatment of the Nervous System" edited by Frederic W. Bancroft and Cobb Pilcher (J. B. Lippincott Company).

RECEDED CHIN

ITS CORRECTION WITH PRESERVED CARTILAGE

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FACES with receding chins are commonly regarded as weak. While this is not a scientifically proved fact, we do know that the chin which recedes disrupts the normal symmetry of the face. Popularly this type of asymmetry is regarded as homeliness, the degree depending upon the deviation from the accepted standards.

ETIOLOGY

New and Erich[1] catalogue the following factors as causative of the receded chin (microgenia): (1) Retarded mandibles due to malocclusion, (2) retarded mandibles due primarily to factors which arrest the growth of the lower jaw and due secondarily to the subsequent malocclusion, and (3) receding chins not associated with malocclusion. The third group includes chiefly the congenital type.

TREATMENT

The correction of receded chins due to malocclusion and arrested growth will not be discussed in this paper because they are essentially a problem for the orthodontist.

In the third group, namely, the congenitally recessive chin, the primary goal of the surgeon is to bring the size and shape of the chin to conform esthetically with the general contour and features of the face.

Various substances have been suggested for the purpose of correcting microgenia.

Paraffin. Kolle,[2] in 1911, advocated the use of paraffin and for many years this material was in vogue. However, its use was abandoned so that today it is rarely encountered except in patients unfortunate enough to have been subjected to these injections. This is mentioned only to reemphasize the danger of a paraffinoma.[3]

Ivory. Next in favor came ivory, which was popularized by Joseph[4] and used by many others.[3] After ivory, other foreign substances such as celluloid and various metals were advocated, their advantages being availability in unlimited quantities and the fact that they can be molded according to requirement.

Tantalum. Among these materials tantalum is particularly promising in that it causes little, if any, tissue reaction and so can be buried indefinitely in the body.[5] Moreover, it is strong, light and malleable. Tantalum deserves a thorough trial in rhinoplastic and chin surgery.

Bone. Bone removed from the tibia or iliac crest has been and still is favored by some surgeons. The chief objection to bone is that it tends to become absorbed over a period of time, thus nullifying the favorably result obtained at the time of making the transplant.

Homocartilage Grafts. Cartilage obtained from the patient's rib for use as a graft probably has the greatest number of advocates. The primary advantage of cartilage is that it can thrive on meager nutrition. The objections to its use are that it entails the risk of an additional operation, and also that it leaves a chest scar. Again, if an infection should unfortunately occur, the two operations may then have been performed in vain. In fact, surgeons have been so concerned by this possibility that many bury unused cartilage under the patient's skin for use in such an eventuality. Lastly, cartilage tends to curl and bend, thus defeating the very purpose its use is hoped to accomplish.

New and Erich[7] have devised a method to avoid curling.

Nasal Hump. Strangely enough, many patients with receded chins also have humped noses of varying sizes which accentuate the chin defect. Some surgeons have utilized the hump, after its removal by rhinoplasty, as a graft for use in correcting the chin deformity. This ingenious procedure, however, is not ideal, having the following disadvantages: (1) It is impossible to predict preoperatively that the size of the hump removed will be sufficient to correct the chin defect; (2) should an accident, such as contamination, occur, the graft would become useless; and (3) if the hump should break while being removed, it cannot be employed as a graft.

The fact that so many agents have been used as implants makes it clear that the perfect one has not yet been found. The ideal transplant should meet certain requirements: (1) Preferably it should not be a foreign body since this is not always tolerated by the host and may be expelled eventually; (2) it must be easily obtainable and in sufficient quantities; (3) it must be pliable; and (4) it should be preservable in a bank, without deterioration, for use at some later date.

Refrigerated Homocartilage. The most dependable and the most efficacious material so far employed is refrigerated cartilage. Experimental studies have demonstrated that septal and rib cartilage grafts preserved in alcohol and buried in human tissue are slowly invaded and replaced by fibrous tissue over a long period of time.[6]

A B

Fig. 1. A, front face before operation; B, front face after operation.

A real contribution was made by O'Connor and Pierce[7] when they revived the use of refrigerated cartilage for grafts. In their latest report they describe its employment in 375 cases with only six infections, an enviable record indeed. Straight

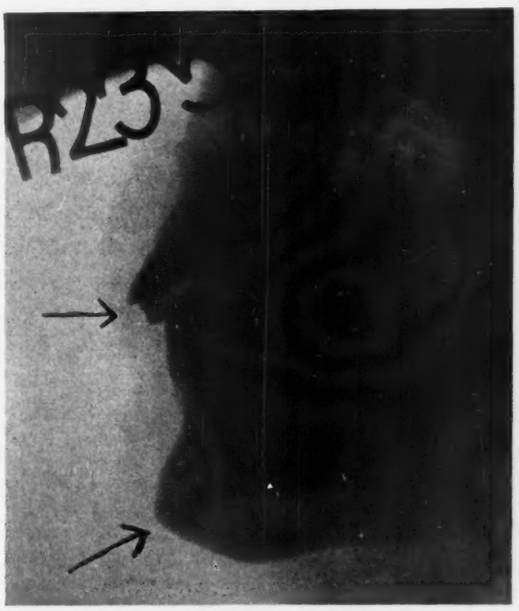

Fig. 2. *X*-ray, lower arrow showing position of graft; upper arrow showing malocclusion.

and Slaughter[8] have implanted refrigerated cartilage in 100 consecutive cases, 81 per cent of which were without complications and 91 per cent of which were successful. My own limited experience with refrigerated homocartilage grafts has yielded entirely favorable results, certainly far more gratifying than those obtained with any other substance used for the same purpose. Although some authors have recommended obtaining cartilage from deceased persons known to have been free from syphilis and tuberculosis, my own preference is the cartilage removed at the time a sympathectomy for hypertension or a thoracoplasty is performed.

Cartilage Banks. Cartilage banks have been suggested[9] and I agree that their use should be encouraged as far as possible. Chest surgeons should be asked to contribute to these banks all of their suitable material and hospitals not having a supply should be enabled to draw upon the cartilage bank according to their need.

CASE REPORT

The patient was a female, aged eighteen, whose microgenia was accompanied by a humped nose. (Figs. 1A and B.) Initially, it was intended to remove the hump and use it for building up the chin. Upon removal, however, the hump was not only insufficient in size but so friable that it broke into several parts. Fortunately, I had an appropriately-shaped piece of preserved cartilage in readiness for just such an emergency.

A B

FIG. 3. A, profile before operation; B, profile after operation.

Under infiltration anesthesia (2 per cent novocain and epinephrin solution 1:25,000) a horizontal submental incision was made, 1.5 cm. in width. In order to accommodate the cartilage implant a tunnel was formed close to the mandible and the cartilage inserted therein. (Fig. 2.) The skin was now sutured and, to insure the fixation of the graft, three additional sutures were passed through the skin covering the chin and through the cartilage. These latter sutures were removed twenty-four hours postoperatively.

The result was quite gratifying. (Figs. 3A and B.)

SUMMARY

A case of microgenia and a method of correction are presented.

Tantalum has been mentioned as a possible satisfactory graft material for use in the correction of facial defects.

Portions of rib removed during sympathectomy or in the course of other thoracic surgery are an excellent source of cartilage, for correcting any facial deficiency, including microgenia.

Refrigated cartilage is recommended as the most successful material used to date.

REFERENCES

1. NEW, G. B. and ERICH, J. B. Retruded chins, correction by plastic surgery. *J. A. M. A.*, 115:

186–191, 1940. Ibid. A method to prevent costal cartilage from warping. *Proc. Staff Meet., Mayo Clin.*, pp. 199–200, 1941.
2. Kolle, S. K. Plastic and Cosmetic Surgery. Pp. 329–334. New York, 1928. D. Appleton & Co.
3. Wolf, G. D. Paraffinoma of the nose. *Am. J. Surg.*, 55: 152, 1942. Ibid. Correction of saddlenose. *Arch. Otolaryngol.*, 22: 304–311, 1935.
4. Joseph, J. Nasenplastic und Sonstige Gesichtplastic. Leipzig, 1928. Curt Kobitsch.
5. Burke, G. L. The corrosion of metals in tissues and an introduction to tantalum. *Canad. M. A. J.*, 43: 125, 1940.
6. Peer, L. Cartilage grafting. *S. Clin. North America*, 24: 404–419, 1944.
7. O'Connor, G. B. and Pierce, G. W. Refrigerated cartilage isografts. *Surg., Gynec. & Obst.*, 67: 796–98, 1938.
8. Straight, C. L. and Slaughter, W. B. Grafts of preserved cartilage in restoration of facial contours. *J. A. M. A.*, 116: 2008–13, 1941.
9. Nun, L. L. Cartilage banks. *Bull. U. S. A. Med. Dept.*, 74: 99–101, 1944.

Operation for harelip is usually indicated in early infancy. . . . Early repair of a cleft lip will minimize lip and nose deformity and aid in molding a coexisting deformity due to a cleft of the alevolar process.

From "Operations of General Surgery" by Thomas G. Orr (W. B. Saunders Company).

SAPHENOUS VEIN AS AN INTRAVENOUS ROUTE

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NUMEROUS articles have been published regarding various intravenous routes as a lifesaving measure when the usual veins are collapsed or cannot be found and utilized. We have often cut down on veins of an arm only to find them too small and contracted for satisfactory use, especially for repeated administrations of plasma or whole blood. Much has been written about intrasternal transfusion in adults and intratibial in children. These routes in my opinion, while of definite value, leave much to be desired. The speed with which fluids may be given by this method is not as great as we may desire. Since this is not a direct intravenous route, naturally it cannot compare with a direct one.

Too much care is usually needed to keep the needle free from plugging and despite the use of a good gauge needle and saline irrigations, stoppage occurs too often, especially when using whole blood; then again there is the possibility of osteomyelitis as a complication.

There are several advantages in using the saphenous vein of either leg. Primarily, the vessel may be located rapidly and easily. The vessel is certainly large enough to serve as a repeated transfusion vehicle for days. The vessel permits direct intravenous administration. Because of its size, this vein can always be suitable regardless of the shock and amount of circulatory collapse. It is indeed large enough to be of definite value in the newborn.

My first attempt at intrasaphenous transfusion came when a patient was admitted to St. Joseph's Hospital with complete burns of chest, back and both arms. Because of the edema and swelling, the cubital veins were not palpable. In the absence of any visible leg veins, it was decided to cut down on one of the saphenous veins.

TECHNIC

The groin and the anterior surface of the thigh are prepared in the usual manner. An incision, about three inches in length, is made parallel to and about one and a half inches below Poupart's ligament on the anterior surface of the thigh. The middle of the incision should be just below the femoral ring. This is lower than the usual incision for the saphenous ligation for varicose veins. We are not interested in ligating its branches; just the exposure of the vein. The incision is carried through the superficial fascia. With blunt dissection, the loose areolar tissue is separated and the saphenous vein is easily located. In the adult, the normal size of the saphenous vein compares with that of a lead pencil. The loose fat is freed from the lateral and anterior aspects of the vein and a curved clamp is passed underneath until the saphenous is completely free. This operation should not take more than two or three minutes, since it is distinctly a minor surgical procedure. After exposure, the intravenous fluids are administered in the usual manner. The wound, in the meantime, is covered with sterile gauze or towels. If repeated transfusions are to be given, a retaining needle with stylet may be left in place; or the needle may be withdrawn and reinserted when needed. If the vein is to be used repeatedly, the wound is dusted daily with sulfathiazole powder and packed with iodoform gauze. At anytime, this incision may be closed and healing by first intention will result.

CONCLUSION

In my opinion, the saphenous vein as an intravenous route can prove a lifesaving

measure when the usual subcutaneous veins are unsatisfactory. The method is far superior to the intrasternal or intratibial route since it permits direct intravenous administrations. Because of its size and location, the saphenous vein of either leg may always be satisfactory regardless of the amount of circulatory collapse. Intravenous saphenous administration should be ideal in maternity mishaps, such as postpartum hemorrhage, etc., because of the speed of direct vein transfusion compared to the intrasternal or intratibial method. Then again, during delivery, the groin and upper anterior surface of the thigh are already prepared and in case of emergency transfusion, the obstetrician need only to extend either leg and expose the saphenous without breaking a sterile technic.

The saphenous route should be of definite value in the newborn and in children, because of its size.

In extensive burns when the subcutaneous veins are obliterated because of the edema, the saphenous may prove to be the only satisfactory intravenous route for plasma or other fluids.

In general surgery, these veins may be used for continuous administrations during prolonged surgery. Again, by exposing one

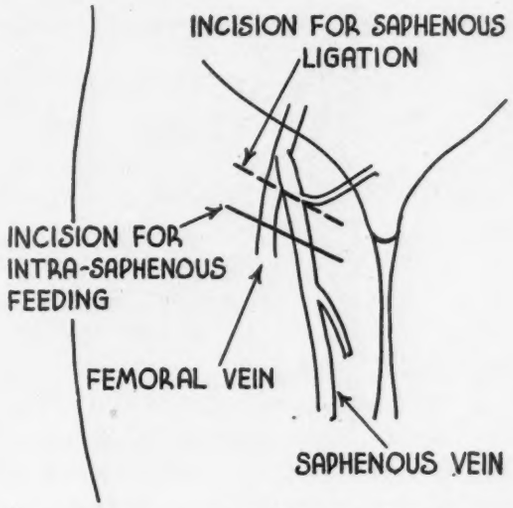

Fig. 1. Shows correct incision for intrasaphenous feeding compared to incision for a saphenous ligation.

or if necessary both of these veins, there need not be any excuse for depriving a patient of a needed transfusion or any intravenous fluids because of the inability to find a suitable vein. Internes may readily be taught the simple technic of saphenous exposure.

Case Reports

FOREIGN BODIES IN AND IN RELATION TO THE THORACIC BLOOD VESSELS AND HEART*

MIGRATORY FOREIGN BODIES WITHIN THE BLOOD VASCULAR SYSTEM

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MEDICAL CORPS, ARMY OF THE UNITED STATES

DURING the past year, in addition to cardiac and pericardial foreign bodies, over seventy missiles have been removed from the mediastinum or other positions in relation to the great vessels of the thorax. In this series three cases stand out for they represent migration within intrathoracic blood vessels.

These migratory foreign bodies were all successfully removed and the patients have been discharged clinically well. The three case histories are presented here with descriptions and illustrations of certain aspects of the surgical technic involved.

The general comments are based on the cases presented and on forty-two cases previously reported. The indications for the removal of intravascular foreign bodies are discussed. Clincal support for these indications is cited from the medical literature and from the author's experience.

CASE REPORTS

CASE 1. This thirty-year old white male officer was wounded in the left infraclavicular region by a 30 calibre machine-gun bullet while in action against the enemy December 26, 1944. The wound was débrided and sutured the same day at a forward installation. Radiographic examination of the chest revealed that the bullet was located posterior to the hilum of the left lung. The patient was evacuated to the 128th General Hospital where it was decided that the size and proximity of the bullet to the hilum of the lung were indications for its surgical removal. He was transferred to this Chest Center at the 160th General Hospital on January 8, 1945.

Admission films (Fig. 1) confirmed the presence of the 30 calibre machine-gun bullet in the hilar region of the left lung. The routine fluoroscopic studies for precise localization suggested nothing more remarkable than a pulsating bullet intimately associated with the hilar structures. It seemed obvious that this missile could best be removed through the conventional posterolateral approach.

On January 19, 1945, a thoracotomy was performed through the left posterolateral approach by resecting 12 cm. of the seventh rib. The bullet was immediately palpated in the central portion of the left upper lobe. This was confirmed by the first assistant. When the surgeon again palpated the lung he was chagrined to find that the missile had vanished. A thorough search of the entire lung, hilum, pericardium and posterior mediastinum failed to discover the bullet. It was then suspected that the missile had fallen into the tracheobronchial tree. Immediate bronchoscopy eliminated this hypothesis. The thorax was closed.

X-rays of the chest taken immediately after the operation (Fig. 2) were reported as follows: "Metallic bullet previously reported in the left chest is now visible lying horizontally just to the right of the body of D-6 pointing outward and apparently in relation to the pulmonary artery area." In view of this shift the missile seemed definitely in the right pulmonary

*Appreciation is expressed to the Sias Laboratories of the Brooks Hospital, Brookline, Massachusetts, for their assistance in the publication of this article and for the provision of facilities for further investigation in cardiac surgery now under way.

artery. The patient made an uneventful postoperative recovery. He was out of bed daily from the first day.

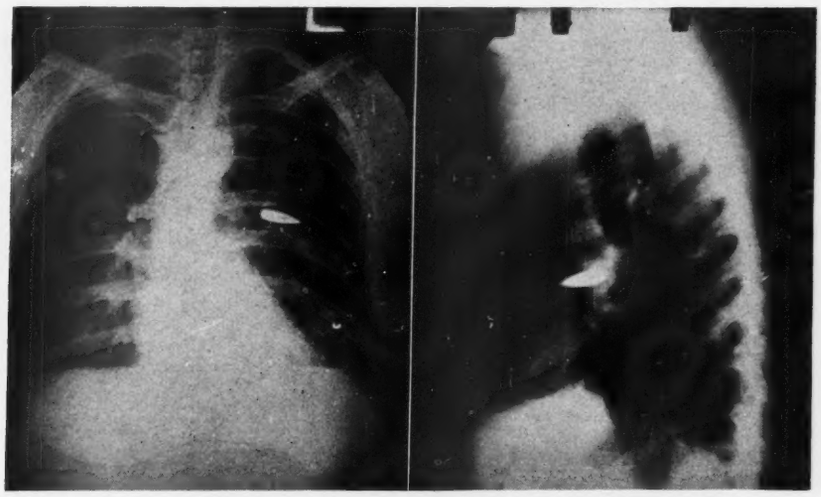

Fig. 1. (Case 1.) Admission films. This 30 caliber bullet in the hilar region of the left lung was later shown to be within one of the radicles of the left pulmonary artery.

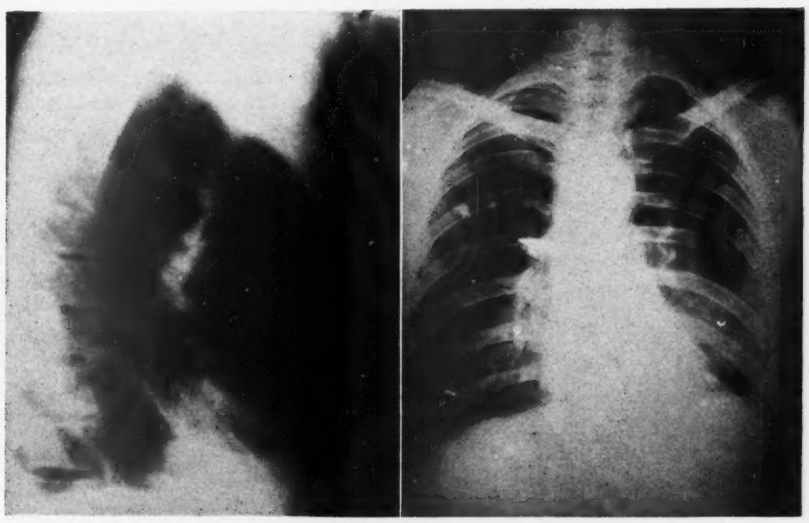

Fig. 2. Case 1. Films taken immediately after the left thoracotomy January 19, 1945. The missile is in the hilum of the right lung. The double image of the bullet in the lateral view is due to its pulsation with the pulmonary artery.

On February 20, 1945 a thoracotomy was performed on the right side, through the third intercostal space anteriorly. (Fig. 3, inset.) The third and fourth costal cartilages were divided close to the sternum. The bullet was palpated in the hilum of the right lung at and in the mediastinum posterior to the superior vena cava. There was no evidence of altered blood flow in the lung. The right pulmonary artery was isolated and a tape was placed about it proximal to the foreign body within the artery. (Fig. 3.) The bullet, point outward, was then digitally manipulated away from the hilum into the pulmonary artery of the upper lobe. (Fig. 3, inset.) This "milking" process was continued until the point of the bullet presented beneath the visceral pleura in the interlobar fissure. The pleura was then nicked and the point of the bullet thrust through. This presenting tip was grasped with a Kocher clamp and the missile delivered by slowly stretching the terminal branches of the pulmonary arterial tree. Hemorrhage was controlled by circumferential mattress sutures of catgut in the lung about the point of removal. (Fig. 3, inset.) The

wound was closed without drainage. The patient was up and about from the first postoperative day and made an uneventful recovery. He was returned to the Zone of the Interior March 30, 1945, for rehabilitation.

lumen of the left pulmonary artery at the time of the first operation and was dislodged at the time of the exploratory palpation.

The technic of removing this bullet

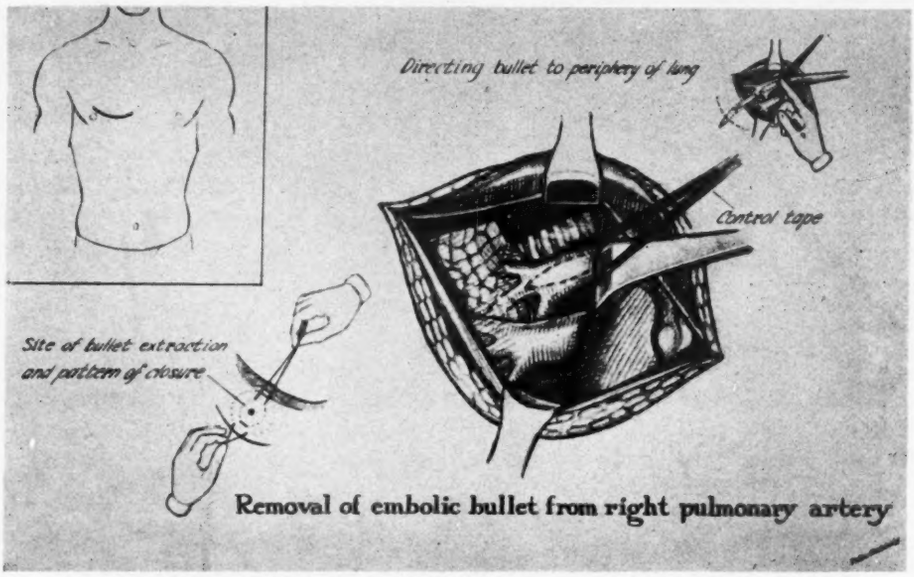
Directing bullet to periphery of lung
Control tape
Site of bullet extraction and pattern of closure
Removal of embolic bullet from right pulmonary artery

FIG. 3. Case 1. The dissection of the right pulmonary artery and the contained bullet is shown. The inset at the upper right indicates the bullet being milked out into the smaller radicles of the pulmonary artery. The left lower inset illustrates the opposing hemostatic sutures about the site of bullet removal.

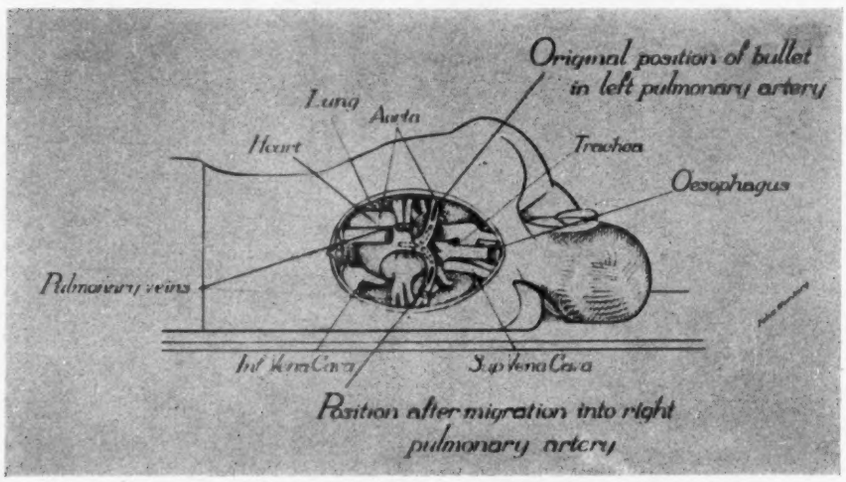

FIG. 4. Case 1. The course of migration of the bullet from the left pulmonary artery into the main pulmonary artery and then out into the right pulmonary artery is demonstrated.

The course of migration and the technic of removal have both been of interest to us. The migration of a foreign body from the left pulmonary artery into the main pulmonary artery and thence to the right pulmonary artery is illustrated in Figure 4. The foreign body evidently was in the

seems simple and obvious. Certainly this procedure was less formidable than opening the right horn of the pulmonary artery, removing the missile and attempting local main branch reconstitution of the vessel. We are not aware of the previous use of this maneuver.

Case II. This soldier was wounded by a shell fragment that entered the upper part of his right posterior axillary line October 14, 1944, while in action against the enemy in France. The wound of entry was débrided and closed the same day at the 60th Field Hospital. *X*-ray studies of the chest revealed a foreign body in the right upper mediastinum 3 cm. posterior to the right sternoclavicular joint. (Fig. 5.) A right hemothorax was also noted and 500 cc. of blood was aspirated. The patient was evacuated to the 154th General Hospital where a pericardial friction rub was heard. On October 21, 1944, a bruit over the right supraclavicular fossa was discovered and it was noted that there was abscence of the brachial and radial pulse in the right arm. Thoracentesis of the right chest repeated November 7, 1944, yielded what was thought to be fresh blood (later found to be old changed blood or so-called "grape juice blood").

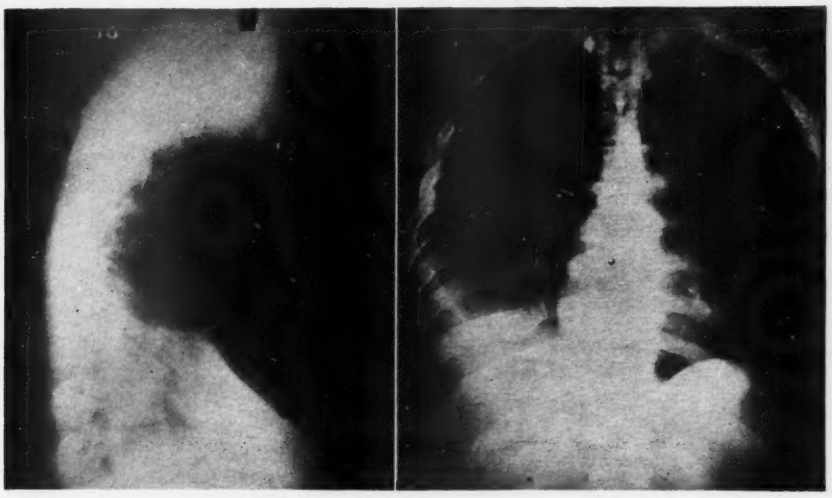

Fig. 5. Case II. Admission films show the shell fragment posterior to the right sternoclavicular joint in the region of the innominate artery.

In view of the above findings the patient was transferred to this Chest Center on November 10, 1944. On entry it was noted that the right hand was cooler than the left and waxy yellow in color. The blood pressure in the right arm was 102/80 while in the left it was 122/68. Fluoroscopic and *x*-ray examinations led to the belief that the foreign body was in relation to the innominate artery. (Fig. 5.) Surgical removal was considered advisable because of (1) the size of the fragment, (2) its proximity to the large vessels in this region, (3) evident vascular damage as attested by the bruit and blood pressure difference in the two arms and, (4) because there was some question about fresh bleeding into the right pleural cavity. The possibility of fresh bleeding suggested that such intervention should be instituted promptly.

On November 12, 1944, under endotracheal gas-oxygen ether anesthesia a U-shaped incision was made over the right upper anterior chest wall. (Fig. 6, inset No. 1.) The sternum was exposed. The internal mammary vessels were divided and ligated in the second intercostal space. The right pleural sac was opened widely, the deep surface of the sternum was cleared of underlying structures and the sternum was split with a power saw longitudinally in the mid-line from the suprasternal notch down to the level of and out through the right second intercostal space. (Fig. 6, inset No. 2.) The segment of sternum with the clavicle and first two ribs attached was reflected upward and outward providing excellent exposure of the superior mediastinum and base of the neck. The superior vena cava and the innominate veins were retracted with tapes. (Fig. 6, inset No. 3.) The innominate artery was isolated at its origin from the aorta and a tape placed about it for hemostatic control.The artery was then dissected free up to its bifurcation into the carotid and subclavion arteries and tapes were placed about each of these vessels. (Fig. 6, inset No. 4.) The foreign body was palpated within the upper portion of the innominate artery. The arterial wall was intact and free of scars. The artery was incised longitudinally and the foreign body removed. The intima in

relation to the foreign body was destroyed in a patchy fashion. Thrombi were removed following which both proximal and distal bleeding from nine to fifteen minutes but going to forty-five minutes at one time. Immediately after operation the pulse was barely palpable

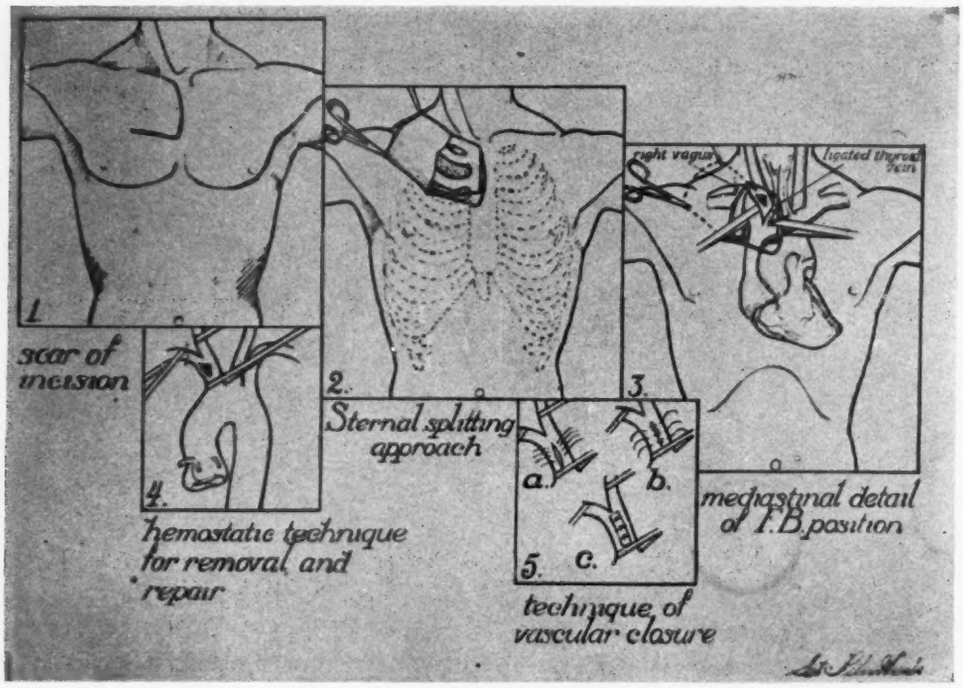

Fig. 6. Case 11. This diagrammatic operative sequence demonstrates the removal of the missile from the innominate artery.

were free. The artery was then closed with interrupted No. 000 silk sutures in two layers. The first layer included the entire arterial wall. The second layer was placed through the adventitia and media, so placed that each suture took a bite on either side of the incision but did not pass through the lips of the incision. (Fig. 6, inset No. 5.) Fibrin foam was tied over the incision with the second layer of sutures. The sternum was drilled and approximated with three interrupted wire sutures. The drill holes for the wire were staggered, the medial ones being lower than the lateral so that when pulled tight, the sternal fragment was drawn downward and inward affording precise and stable reconstruction of the pectoral girdle. (Following operation stability is of great importance as movement of loosely held sternal fragments is both painful and shocking). The pectoralis muscles were approximated with interrupted No. 00 chromic catgut. The superficial fascia was closed with No. 00 chromic catgut and the skin was sutured with No. 1 black silk. No drains were used.

The patient was heparinized for three days following operation, the clotting time averaging in the right arm. The first postoperative day the blood pressure was 122/80 in the left but unobtainable in the right arm. The second postoperative day, November 14, 1944, the right stellate ganglion was infiltrated with procaine. The right arm immediately became warm and a systolic blood pressure of 68 was obtained. On November 17, 1944, the blood pressure in the left arm was 132/60 while in the right arm it was 98/76. Thirteen days after operation the pressure was 124/86 on the left and 108/64 on the right. Hoarseness was present for four weeks following operation due to manipulation of the right recurrent laryngeal nerve but this disappeared. The postoperative hemothorax was evacuated by aspiration. The patient went on to recover with firm union of the sternum and suffered no circulatory disturbance. When the blood pressure was taken January 15, 1945, it was found to be equal in both arms. He was returned to the Zone of the Interior March 1, 1945, for rehabilitation.

Inasmuch as the wall of the innominate artery and adjacent portion of the aorta were everywhere intact at operation, it

seems that the course of the missile must necessarily have been through the right side of the chest and into the pulmonary vein or the left side of the heart. It was then carried as an embolus by the blood stream into the aorta and thence to the innominate artery where it lodged. (Fig. 7.) The pericardial friction rub noted prior to operation suggests that the pericardium was transgressed and that the foreign body entered the left side of the heart, thus entering the arterial circulation. In short, this case represents a penetrating wound of the heart or pulmonary vein with arterial embolism of the foreign body to the innominate artery.

The sternal splitting incision has been described in some detail. It has often proven useful in approaching the structures of the superior mediastinum or the base of the neck. No ribs are cut, nothing is resected and nothing is discarded. When the sternum is approximated carefully with wire, it heals rapidly and is functionally solid from the time of operation. The reverse of this incision through the left side of the sternum has been used in approaching the base of the left carotid and subclavian arteries at the aortic arch.

Surgical intervention in injuries of the innominate artery is perhaps always undertaken with some misgivings. Circulatory disturbances in the homolateral arm and a contralateral hemiplegia are possible complications. These misfortunes are unusual, particularly in this age group, but none the less stimulate the surgeon to restore vascular continuity when possible rather than ligate the innominate artery. This approach and technic served our purposes well.

Case III. This twenty-two year old white soldier was struck in the right axilla at the level of the fifth rib by a machine-gun bullet July 15, 1944, while in action against the enemy in France. He was evacuated to the 159th General Hospital. Routine chest films taken there on July 17, 1944, were entirely within normal limits. (Fig. 8.) The lateral film adequately established the retrocardiac zone as free of metallic missiles.

He was sent to the rehabilitation barracks symptom free. He had been there about three

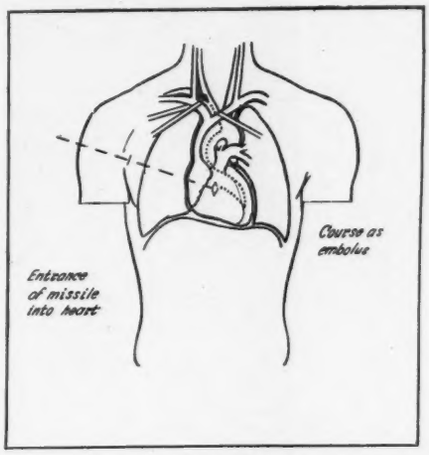

Fig. 7. Case II. The probable course of the missile from the left auricle, through the left ventricle and aorta to the innominate artery is represented.

weeks, enjoying a vigorous athletic program when, on the morning of August 13, 1944, at 2 A.M., he was awakened by agonizing pain in the lower part of the left side of his chest. This was accompanied by dyspnea, orthopnea, cough and hemoptysis. There were râles and diminished breath sounds over the left axilla.

On August 15, 1944, *x*-ray studies of the chest (Fig. 9) revealed a foreign body (30 calibre bullet) in the region of the hilum of the left lung. Bronchoscopy performed on August 9th revealed "edema and an injected bleeding point on the posterolateral wall of the left main bronchus." The continued hemoptysis and bronchoscopic findings indicated erosion of the bullet from the pulmonary artery into the left main or descending bronchus and transfer of the patient to this Chest Unit was thought advisable. This was done on August 22, 1944.

At this Chest Center it was agreed that the erosion of this bullet from the pulmonary artery into the bronchus constituted an urgent indication for surgical intervention.

Thoracotomy was performed on August 28th, through a posterolateral approach by resecting a 16 cm. segment of the left seventh rib. Exploration revealed discoloration of the lingular portion of the left upper lobe and to a lesser extent the anterior basic segment of the left lower lobe. Through the interlobar fissure the missile was palpated in the lower lobe and

hilum intimately associated with the artery. A fluctuant area about 1 cm. in diameter was noted over the base of the bullet. The hilum was exposed so that compression of the pulmonary artery could be effected by grasping the hilar structures from above downward between the surgeon's left index and middle fingers. This finger compression was not only hemostatic but served to stabilize the missile. Thus controlled, the fluctuant area was incised and the butt of the bullet found to lie in an abscess cavity anterior to and including the anterior surface of the lower branch of the left pulmonary artery. The body and point of the bullet, however, lay within the artery and when the missile was extracted the full arterial stream issued from the defect. This was at all times completely under control as attested by voluntary release and then compression with hemostasis. The abscess cavity was carefully débrided and mattress sutures placed through its wall and the subjacent artery. Fibrin foam impregnated with penicillin was placed under the mattress sutures and the sutures tied, thus effecting a good closure of the vessel. The gangrenous lingular process was resected. The line of resection was closed with mattress sutures of No. 00 chromic catgut. The anterior basic segment of the lower lobe was considered viable and not disturbed. The lung re-expanded readily. Penicillin, 100,000 units, and 50 cc. of 2.4 per cent sodium citrate solution were

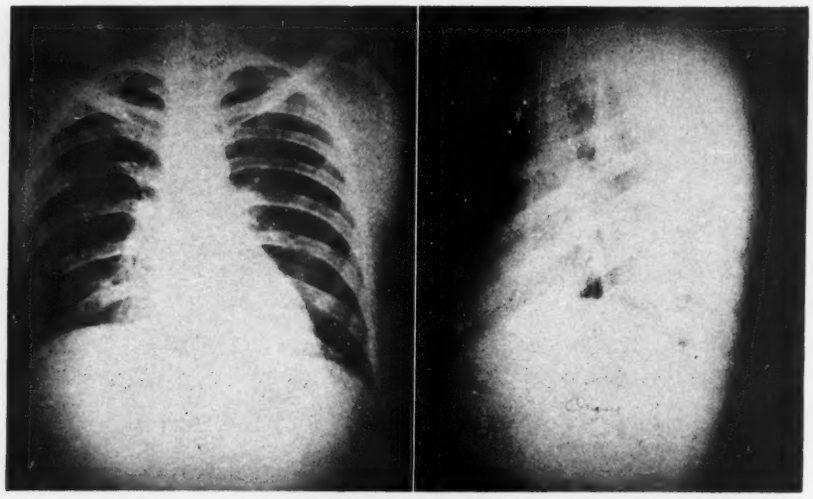

FIG. 8. Case III. Routine films of July 17, 1944, show clear lung fields.

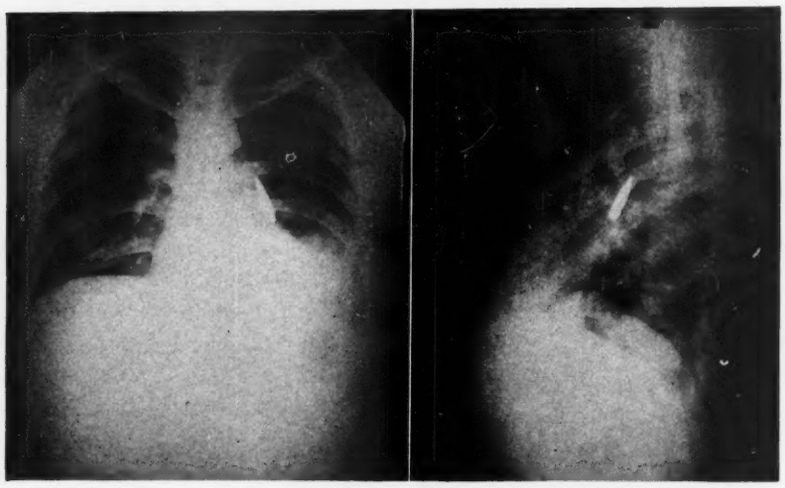

FIG. 9. Case III. Films taken August 15, 1944. Two days after the sudden onset of pain in the left lower hemithorax a 30 caliber bullet is visualized in hilar region of the left lung. The missile was found in the left inferior branch of the pulmonary artery.

instilled in the pleural space and the chest wall was closed. The patient was up and about the ward within forty-eight hours. The postoperative left hemothorax was aspirated. The patient was discharged to a Rehabilitation Hospital December 1, 1944.

This case is striking because of the embolic nature of the foreign body as supported by symptomatology, *x*-ray studies and operative findings. There can be no question of confusion in the *x*-ray films as the patient's identification tags were included on the film at each *x*-ray exposure. Furthermore, his left first rib is characteristic in shape. The exact portal of entry into the circulation can only be surmised but as the chest is clear in the original films and the wound of entry in the lower axilla, it follows that the portal of entry was most likely in the liver. The bullet then began its course in the inferior vena cava, was carried to the right auricle, then to the right ventricle and out into the pulmonary artery. (Fig. 10.) The bullet entered the left branch of the pulmonary artery and lodged in the branch to the lower lobe and lingula in such a way as to occlude the arterial supply to the lingula as it arises from the lower lobe artery in this region. It is interesting that occlusion of the pulmonary circuit was associated with parenchymal change.

The method of controlling hemorrhage by hilar compression between the fingers of the surgeon's hand and the technic of closing the defect in the pulmonary artery were simple and functional.

COMMENTS

Strauss collected thirty-two cases of intravascular migratory foreign bodies and added one himself in a review of the medical literature in 1942.[3] The authors have found nine additional cases in the literature prior to 1942,[4–9] which, with those of Strauss, make a total of forty-two. Unquestionably, there have been other cases reported, especially in recent years. The following comments are based on these forty-two cases and the three presented here. This communication is not intended as review of the literature, but rather as a general consideration of

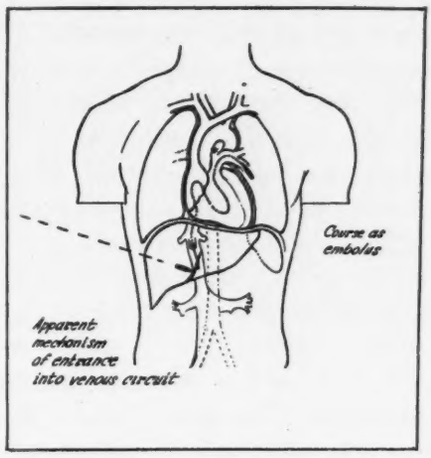

FIG. 10. Case III. The course of migration of the bullet from its entry into the inferior vena cava, through the right auricle and ventricle and out into the left pulmonary artery is indicated.

foreign bodies that migrate within the blood vascular system. The subject is interesting because of the infrequency of such incidents, also, the bizarre embolic course and dramatic developments that have characterized many of the cases on record. The majority of these cases have been associated with war wounds. The foreign bodies in almost all instances have been bullets or shell fragments.

Migration has occurred about equally in the arterial and venous circulations, depending on which the missile happened to enter.

In the arterial circulation the course of migration of foreign bodies and resultant clinical pictures vary with the portion of the arterial tree involved. In eleven of the forty-two cases the missile entered one of the larger arteries and passed peripherally as an embolus.[11–16] There were five instances in which the projectile entered the left ventricle and was swept out into the aorta to lodge within this vessel or its branches.[8,10,11,12] In two cases the foreign body is said to have entered one of the pulmonary veins and passed into the left ventricle[12,13] while in one patient

such a foreign body passed on through the left ventricle to become embolic to the right femoral artery.[17] In two instances, missiles entered the ascending aorta and fell downward against the arterial stream. One came to rest in the sinus of Valsalva[18] and the other in the left ventricle.[19] One missile entered the pulmonary artery, migrated downward into the right ventricle and, seven days later, became embolic to the right pulmonary artery causing sudden death.[20] It is apparent that there is considerable latitude in the possible patterns of migration.

Varying degrees of arterial insufficiency due to embolic missiles have been observed. The extreme is the above fatal pulmonary embolus.[20] O'Neill observed transient blueness and coldness of the left leg caused by a shell fragment embolic from the left ventricle to the left common iliac artery.[10] In one of the authors' cases (Case III) an embolic bullet in the lower lobe branch of the left pulmonary artery led to gangrene of the lingular portion of the left lung. This patient experienced severe pain in his chest when the migration occurred. In another of these cases (Case II) a diminished pulse and blood pressure were noted in the right arm following embolism of a shell fragment to the right innominate artery.

When the foreign body involved the venous circulation, in the majority of instances, the missile entered one of the larger veins, migrated to the right auricle and came to rest in the right ventricle. This occurred in nine of the group of forty-two cases.[5,7,9,13,21,22] There were three instances in which the projectile entered one of the larger veins, was carried into the right auricle and then travelled down the vena cava to come to rest in one of the tributaries of this vessel.[4,6,23] In another case a bullet entered the inferior vena cava and migrated to the junction of the common iliac veins.[11] There was one instance of the missile entering the right ventricle and then passing into the pulmonary artery.[12] In the case that Strauss reported, a bullet entered the right common iliac vein and travelled to the left pulmonary artery.[3] Death occurred four days later but was not due to the embolic missile. Walcher described a case in which the projectile entered the long dural sinus and then migrated into the sigmoid sinus.[14] In another instance the missile entered the venous circulation through a thigh wound and was found at autopsy in the left ventricle of the heart.[7] There was a widely patent foramen ovale.

Without going into exhaustive detail we have made an effort to point out the great variety of migratory patterns that have occurred in these cases as well as the relative frequency with which they are encountered. The possibilities are legion.

As a rule intravenous foreign bodies are asymptomatic. One patient who had a missile that had migrated into his right ventricle complained of pain over his heart.[7]

The case reported by Lyle serves to emphasize the danger of infection associated with intravascular foreign bodies. This patient died of a generalized gas bacillus infection. The wound of entry in the thigh showed no evidence of infection at autopsy. The foreign body, with fragments of clothing adherent to it, was found in the cavity of the right ventricle. There was a fibrinopurulent pericarditis and gas bubbles were noted in the myocardium. The missile with attached clothing was the apparent source of infection.

The patterns of migration in the three cases that are reported here deserve mention. The shift of a missile from one pulmonary artery to the other, and the migration of a missile to the innominate artery are both unique among cases known to us. Pulmonary embolism of a missile coming from the venous circulation has been reported.[3,12]

Though one's fancy is stirred by the unusual nature of these cases, a pessimistic attitude is engendered as most of them have ended fatally. Among the thirty-three cases in Strauss' report only

six patients survived. The pathologist has generally been the one to remove the foreign body and to establish the course of migration.

Bearing in mind the possibility of missiles migrating in the blood stream, a careful search should be continued until the missile is located in all cases of penetrating wounds. If such a patient develops unexplained symptoms, use should be made of the fluoroscope and *x*-ray to ascertain whether or not a migratory missile is responsible.

With the progress of vascular and thoracic surgery and the tremendous advances in anesthesia of the past twenty years there will be few intravascular foreign bodies that cannot be attacked surgically. These advances have brought the thoracic blood vessels and the heart within the province of safe surgery. Such a viewpoint is supported by the three cases reported in this communication.

There are four cardinal indications for removing intravascular foreign bodies: (1) To avoid the hazards of vascular occlusion; (2) to diminish the dangers of sepsis (local and systemic); (3) to prevent erosion and hemorrhage; and (4) to remove the possibility of embolism.

Each of the above tenets has adequate support in the medical literature reviewed in this communication as well as direct confirmation within the experience of the authors. Tenet No. 1 is well demonstrated in the gangrenous lingular portion of the left upper lobe in Case III. (This theoretically should not have occurred in the presence of a normal bronchial circulation.) Tenet No. 2 is represented by Lyle's case in which there was a fatal septicemia. The embolic missile, found in the right ventricle of the heart, was the source of infection.[5] Tenet No. 3 has been abundantly emphasized. Recently one instance each of fatal hemorrhage from erosion of the aorta and pulmonary artery has come to the authors' attention. Tenet No. 4 has its elaboration in the substance of this article.

In closing, the authors would like to emphasize four simple technical points that have been helpful in these and a number of other operations on the mediastinum: First, the liberal use of sternal splitting with firm craftsman-like fixation at the end of the procedure has provided good exposure at operation and has minimized this source of postoperative pain and shock. Second, manipulation of the missile from the right main pulmonary artery to the periphery in Case I has the advantage of surgical intervention in the relatively safe peripheral zone rather than in the more hazardous hilar region of the pulmonary artery. Third, the finger tourniquet grip used for hemostasis in Case III is a useful maneuver whenever bleeding from a lung is encountered. Fourth, the use of the patient's position on the operating table and direct fixation of the missile to prevent migration during the operative manipulation have been illustrated.

Unquestionably the surgical experience of this war will broaden our knowledge of this field and point out important technical aids in the surgical management of individual cases.

SUMMARY

1. Three cases are reported in which migratory missiles were successfully removed from intrathoracic blood vessels.

2. Salient aspects of the surgical technic employed are presented.

3. Forty-two cases of previously reported foreign bodies that have migrated within the blood vascular system are reviewed and commented upon.

4. Four cardinal indications for the removal of intravascular foreign bodies are presented with clinical support for each.

REFERENCES

1. Harken, Dwight E. Foreign bodies in and in relation to great vessels and heart. I. General comments and a consideration of techniques for approaching and removing foreign bodies from the chambers of the heart. *Surg., Gynec., & Obst.* (in press).

2. Harken, Dwight E. and Zoll, Paul M. Foreign bodies in and in relation to great vessels and heart. III. Indications for the removal of intracardiac foreign bodies and the behaviour of the heart during manipulation. *Am. Heart J.* (in press).
3. Strauss, R. *Arch. Path.*, 33: 63–68, 1942.
4. Grandgérard, *Presse méd.*, p. 365, August 27, 1916.
5. Lyle, H. H. M. *J. A. M. A.*, 68: 734, 1917.
6. Gregory, H. L. *Brit. M. J.*, 6: 482, 1917.
7. Editorial. *Lancet*, 2: 395, 1917.
8. Cueli, L. F. and Bonnet, F. *Semana méd.*, 1: 638–644, 1941.
9. Pezzi, C. *Arch. d. mal. du coeur.*, pp. 285–292, 1917.
10. O'Neill, C. S. *Brit. M. J.*, 2: 719–720, 1917.

Cited by Strauss[3]

11. Schloffer, H. *Beitr. z. klin. Chir.*, 37: 698, 1903.
12. Rubesch, R. *Beitr. z. klin. Chir.*, 80: 394, 1912.
13. White, W. *Indian Ann. M. Sc.*, 1: 289, 1853.
14. Walcher, K. *Zentralbl. f. Chir.*, 59: 1220, 1932.
15. Gonzales, T. A. *Am. J. Surg.*, 26: 43, 1939.
16. Jecks, C. *Lancet*, 1: 800, 1890.
17. Schmidt, G. B. *Zentralbl. f. Chir.*, 1: 131, 1885.
18. Tegeler. *München. med. Wchnschr.*, 24: 1740, 1909.
19. Singleton, D. *Lancet*, 1: 33, 1879.
20. Paltaul, R. *Wien. klin. Wchnschr.*, 46: 602, 1933.
21. Davis, T. *Tr. Proc. M. and S. A.*, 2: 357, 1834.
22. Hues. *München. med. Wchnschr.*, 66: 46, 1919.
23. Borzeky, K. *Beitr. z. klin. Chir.*, 40: 243, 1903.

The effects produced by *gunshot wounds* vary according to the velocity and size of the missile and the area wounded, from a simple drilling or perforating wound to extensive disorganization or explosive disruption of tissue.

From "Principles and Practice of Surgery" by W. Wayne Babcock (Lea & Febiger).

CONGENITAL ATRESIA OF THE BILE DUCTS

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SINCE Thomson's[21] careful analysis of fifty-two cases in 1892, there has been an increasing interest shown in the surgical management of congenital atresia of the biliary ducts. Such developmental anomalies were pathologic curiosities until Holmes made a detailed study of one hundred such cases and claimed that some could have been relieved by operation. The first successful operation of this type was performed by Ladd in 1927.[14] The purpose of this report is to record two additional cases of atresia of the biliary ducts which recovered from operation. These patients serve to illustrate some of the surgical features in the management of this disease.

There have been few changes in the etiological and pathological concepts of congenital atresia of the biliary ducts in recent years. These topics have been adequately discussed in other reports.[5,6,9,14,15,20]

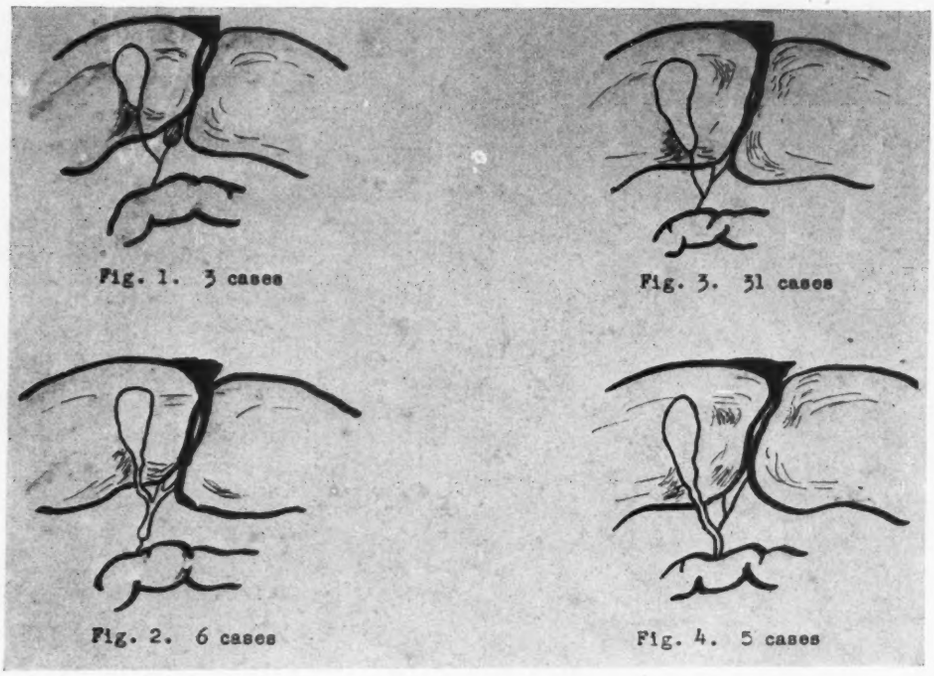
The diagnosis is not easy to make, and usually is only proven at operation or autopsy. Errors may also occur in interpretation of the operative findings. This may have been the case in the second patient discussed in this report. Donovan[6] reports two cases which were found to be inoperable at operation, there being no evidence of extrahepatic biliary systems, and the patients were living, free of jaundice or retarded development, two and a half and three years later. Such are the exceptions, however. The majority found to be inoperable have died within two years and autopsy showed no extrahepatic biliary ducts with marked cirrhosis of the liver.

CASE REPORTS

CASE 1. Baby B., a male infant born at full term by spontaneous delivery on October 12, 1944, appeared normal at birth but on the third day developed jaundice which increased in severity. The stools were acholic, and the urine showed bile and was dark in color. The baby's temperature was the intermittent type ranging from 101°F. to normal. The blood count showed 55 per cent hemoglobin with 4,320,000 red blood cells. Wasserman tests for the parents and the baby were negative. At birth there was a marked overriding of the bones of the skull which disappeared at the end of two weeks, as shown by *x*-ray. Two other children in the family were perfectly normal. The baby became progressively worse with increasing jaundice, marked emaciation, dehydration, diarrhea (steatorrhea) and loss of weight. Prothrombin time was twenty-five seconds compared to sixteen seconds for control prior to operation, and the patient was considered a very poor operative risk. In preparation for operation, injections of vitamin K, subcutaneous saline and small blood transfusions were given.

Physical examination revealed a well developed, white, male infant, alert, but with a rather weak cry. The birth weight was seven pounds one and one-quarter ounces. There was a marked degree of jaundice of the skin and sclera. The diapers showed marked bile staining from urine. There was an abnormal amount of fusion of the fontanel. Posteriorly the skull bones were overriding. Eye, ear, nose and throat findings were essentially negative. The heart and lung findings were normal. The abdomen was distended with prominent veins visible in the epigastrium. The liver was enlarged to the umbilicus. No other organs or masses were palpable. The genitalia and ex-

tremities were normal in development. The Pediatric Department diagnosed the case as congenital malformation of the biliary duct rátion and coramine. With the patient's condition improved, the dissection of the blind end of the common duct was resumed in prepa-



FIGS. 1 to 4. Illustrations of the four most frequent types of anomalies encountered in Ladd's series of forty-five cases. Figures 1 and 2 are the types most amenable to surgery.

system with resultant obstructive jaundice, requiring early exploration.

On the twelfth day, under local and general anesthesia (ether), through an upper right rectus muscle-splitting incision, an abdominal exploration revealed an enlarged plum-colored liver. The right lobe was retracted to expose the gallbladder which appeared normal in size, shape and position. From the gallbladder neck, the cystic duct was dissected from the gallbladder to the junction with the common duct. The rest of the biliary duct system was dissected in the hope of finding the obstruction. Local anesthesia was used up to this point in the operation because of the poor condition of the baby, but to keep the patient quiet during the tedious, minute dissection, we deemed it advisable to give open drop ether for a short period. The common duct was found to terminate in a bulbous end a short distance from the duodenum, with only a fibrous cord distally. The anomaly was similar to that seen in Figure 2. In dividing the fibrous cord no lumen was found. At this point respiratory failure ensued. Resuscitation was accomplished by transdiaphragmatic massage, artificial respiration for choledochoduodenostomy, which is most desirable (Ladd). We proved that the gallbladder was connected through the cystic and hepatic ducts to the liver in a normal manner by aspirating bile from the gallbladder, and therefore chose cholecystogastrostomy, which is technically easier to perform but suitable only in cases illustrated by Figure 2. The anastomosis was completed by two rows of sutures, inner No. 000 chromic catgut, outer row of 36 alloy steel over a short piece of No. 10 F. catheter, used to maintain the lumen. The abdomen was closed without drainage in three layers, using chromic catgut No. 00 for peritoneum and posterior sheath, anterior sheath of rectus united with interrupted 35 wire, subcutaneous fat and skin 35 and 38 wire.

The jaundice began to improve rapidly the day following operation. The stools and urine became normal in color. The baby retained fluids and formula and gained weight. By the third day the temperature range was 102.2°F. to normal. On the fifth postoperative day the wound showed redness, induration and evidence of beginning separation and imbeding of sutures. The wound edges separated down to

the anterior sheath after removal of the sutures. Aerobic and anaerobic cultures showed no pathogenic organisms of note, therefore, we believed that the distention, dehydration, icteric skin and liver dysfunction were features which contributed to the wound disruption. However, after treatment with various other measures, zinc peroxide paste rapidly promoted wound healing in three weeks.

FIG. 5.

FIG. 6.

FIG. 5. Baby B. on the twelfth postoperative day, showing marked separation of skin and subcutaneous tissues.
FIG. 6. Baby B. nine months postoperatively, with complete healing of the wound and showing normal development.

Twenty-four days postoperatively, the baby developed a sterile abscess on the left thigh at the site of repeated injections of vitamin K. The patient was observed in the hospital for four months, awaiting adoption. Two months postoperatively a stool fat analysis indicated impaired fat digestion, total fats 26.6 per cent wet and 51.1 per cent dry. The baby was not examined again until twelve months later when it showed normal development without any biliary symptoms.

Comment. This case, fortunately, was one of the 20 per cent anomalies (Ladd)[16] that was amenable to surgery, the patient having had relief from jaundice of the obstructive type immediately after operation, and freedom from symptoms for fourteen months. Our objective was to establish a connection for the biliary system directly with the duodenum or stomach. Early operation is advantageous in such cases in which jaundice, dehydration and loss of weight increase the risk. Many cases that Donovan,[6] Ladd[14,15,16] and others have reported were not explored until from one to five months after birth. Prolonged periods of procrastination will only lead to emaciation, biliary cirrhosis and fatal outcome.

Although great relaxation cannot be obtained by local anesthesia, our experience from this case leads us to believe that general anesthesia (ether), as usually recommended, is hazardous. The use of a short tube, No. 8 or 10 F., was necessary to maintain the lumen during formation of

the cholecystogastrostomy. To prevent the tube (No. 10 F. catheter one inch long) from slipping back into the gallbladder or

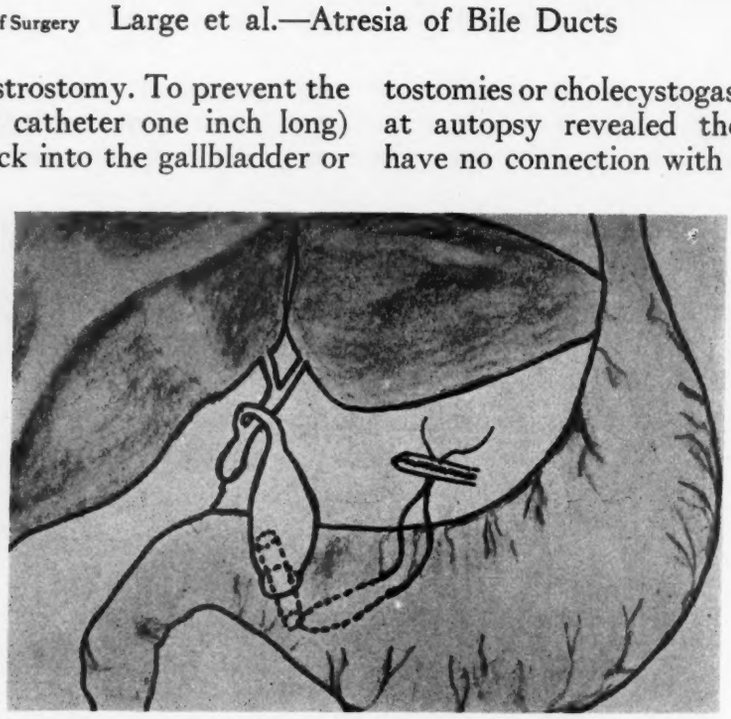


FIG. 7. Illustration of No. 10 F. catheter in anastomotic stoma which is ready to be pulled into the stomach by the suture through the end of the tube and the anterior wall of the stomach. The suture is removed and the tube allowed to pass through the intestinal tract.

remaining lodged in the stoma, a suture was passed through the end of the tube, then through the stomach wall from within outward. This suture was used to pull the tube into the stomach at the completion of the anastomosis after which it was removed. The tube was followed by *x*-ray until it was passed by the rectum at the end of three days. One case is recorded in which the tube remained at the site of anastomosis and ulcerated into the free peritoneal cavity, causing a fatality.[14]

Zinc peroxide dressings in the treatment of wound disruption proved most beneficial. Debility, abdominal distention and jaundice are the main factors in causing wound disruption which is commonly experienced in these cases. Closure of the wound in layers with alloy steel interrupted sutures has been efficacious in preventing complete wound disruptions and eviscerations. Painstaking care with thorough dissection of the extrabiliary duct system is essential in determining the type of operation to be used, and for the success of the operation and survival of the patient. This fact is well illustrated by cholecystostomies or cholecystogastrostomies which at autopsy revealed the gallbladder to have no connection with the biliary ducts or the liver. The obvious lesson to be gained is that one should have good evidence that the gallbladder connects with the liver or biliary system before anastomosing it to the gastrointestinal tract.

CASE II. Baby C., a normal full term female of spontaneous delivery, weighing six pounds two and one-half ounces, was born November 14, 1944. There were no external evidences of any congenital abnormalities. The second day after delivery the baby became markedly jaundiced, and the jaundice continued to increase without remission. The stools were acholic and the urine deeply bile-stained. Red blood count was 3.85 mil., 80 per cent hemoglobin, 19,500 white blood cells. Two days later the red blood count was 3.90 mil., 77 per cent hemoglobin, 11,400 white blood cells, normal differential, R.H. factor negative, type 4-0. The patient responded to two transfusions of citrated blood, 100 cc. each. Diagnosis at first was erythroblastosis fetalis and was later changed to obstructive jaundice due to congenital atresia of the bile ducts. With no clinical improvement after ten days, the baby was referred for exploration.

Under local anesthesia, a right rectus incision was made from the costal margin to the umbilicus. The abdomen was explored, viscera packed off and the liver edge retracted. The gallbladder was visualized as small and normal. Dissection of the cystic duct was begun at the gallbladder. No cystic duct could be found, but only solid fibrous cords of tissue leading to a similar cord of tissue representing the common duct. Dissection was continued above to the hepatic duct, but no normal bile passage could be located. These solid cords were divided. Attempts to probe the duct were unsuccessful. After two hours of exploration with the biliary system exposed, we concluded that this was an inoperable case with an anomaly similar to that in Figure 3 which is the most common type found. A No. 20 gauge needle was used to aspirate the gallbladder which contained only a small amount of clear mucus showing no bile or connection with the liver. With the hope that some minute biliary radicle might drain off the bile, a small catheter was left along the inferior surface of the liver at the site of the common duct. The abdomen was closed in layers with all steel wire (35).

Following the operation there was no improvement in the jaundice for one month. No bile or fluid ever drained from the catheter. There was no demonstrable improvement for six weeks after which time the stools became gradually darker in color and the jaundice decreased. Although the baby retained the formula well, she did not gain any weight for five weeks. The wound separated from end to end down to the anterior sheath of the rectus on the fifth day. Wound cultures were negative. The incision healed rapidly with zinc peroxide dressings. The baby has progressively improved during the past twelve months and appears to be developing normally in every respect.

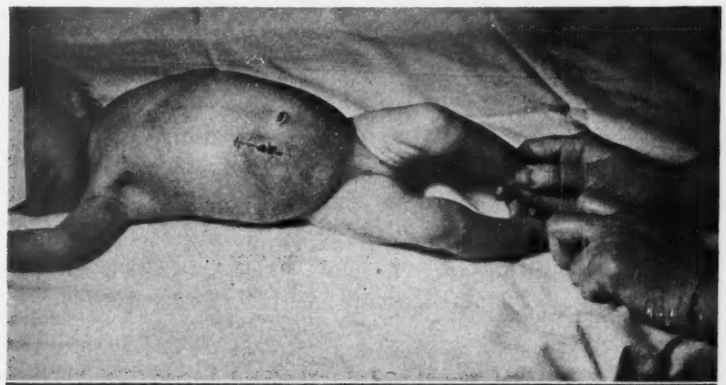


Fig. 8.

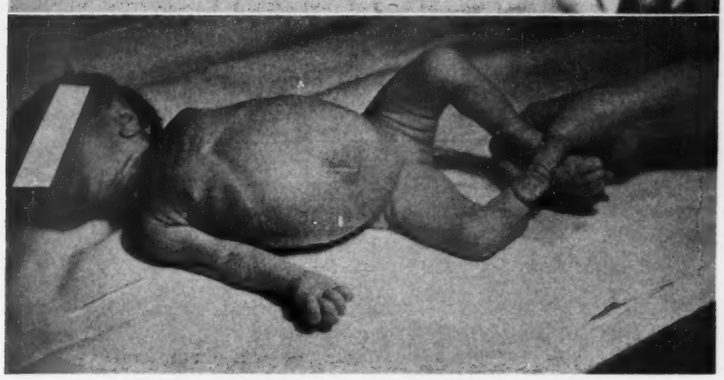


Fig. 9.

Fig. 8. Baby C. seven days postoperatively, showing the catheter through the wound extending down to the inferior surface of the liver. Also note the separation of the wound edges.

Fig. 9. Baby C. one month postoperatively, showing the wound well healed but emaciation, abdominal distention and jaundice still present.

Comment. This case, in contrast to the one previously discussed, was of the common type of malformation (Fig. 3) which represents 68 per cent of Ladd's series. Similar cases have been reported by Donovan and Finlayson in which thorough

exploration found the patients inoperable. Three of these patients lived two and a half and three years. The supposition gained from this case is that we overlooked or were unable to find the minute duct. This does not appear to be so, because unlike the previous case in which the jaundice began to clear the following day, this case took six to eight weeks before the jaundice disappeared. Nothing was gained through attempts at external biliary drainage by catheter. Cholecystoduodenostomy in this type case is contraindicated especially when no bile was found in the gallbladder. Ladd re-explored such a case and found an excellent anastomosis, but there was no connection from the gallbladder to the biliary system or the liver, and autopsy confirmed the finding that no extrahepatic ducts were present.

SUMMARY

1. The common types of deformities encountered in congenital atresia of the biliary ducts are discussed, showing those which are operable.

2. A report of one of the operable cases is recorded with recovery following a cholecystogastrostomy.

3. A case report of one of the apparently inoperable types of deformity with no extrahepatic ducts found at operation, which recovered from operation and is living and well at the end of thirteen months.

REFERENCES

1. Amberg, S. and Walters, W. *Proc. Staff Meet., Mayo Clin.*, p. 13, 1938.
2. Amberg, S. and Zuschlag, E. *Proc. Staff Meet., Mayo Clin.*, p. 570, 1944.
3. Boyden, E. A. *Minnesota Med.*, 27: 932, 1944.
4. Cole, W. H. *Arch. Surg.*, 23: 820, 1931.
5. Deaver, J. M. B. *Am. J. Dis. Child.*, 46: 356, 1933.
6. Donovan, E. J. *Ann. Surg.*, 106: 737, 1937.
7. Finlayson, C. *Arch. Dis. Child.*, 12: 153, 1937.
8. Gonce, J. E., Jr. *Proc. Interst. Postgrad. M.A.N.A.*, p. 222, 1942.
9. Gross, R. E. *Arch. Surg.*, 32: 131, 1936.
10. Holmes, J. B. *Am. J. Dis. Child.*, 11: 405, 1916.
11. Hopkins, N. K. *Lancet*, 61: 90, 1941.
12. Howard, C. D. and Wolbach, S. B. *Arch. Int. Med.*, 8: 557, 1911.
13. Kirshbaum, J. D. *Am. J. Dis. Child.*, 47: 1080, 1934.
14. Ladd, W. E. *J. A. M. A.*, 91: 1082, 1928.
15. Ladd, W. E. *Ann. Surg.*, 102: 742, 1935.
16. Ladd, W. E. and Gross, R. E. Abdominal Surgery of Infancy and Childhood. Pp. 260–273, Philadelphia, 1941. W. B. Saunders.
17. McClendon, S. J. and Graham, H. K. *Arch. Pediat.*, 48: 791, 1931.
18. Montgomery, A. H. *S. Clin. North America*, 16: 93, 1936.
19. Stolkind. *Brit. J. Child. Dis.*, 36: 115, 1939.
20. Sweet, L. K. *J. Pediat.*, 1: 496, 1932.
21. Thomson, J. *Edinburgh M. J.*, p. 733, 1892.
22. Watkins, A. G. and Wright, G. P. *Lancet*, 20: 1066, 1933.

SPONTANEOUS RUPTURE OF THE APPARENTLY NORMAL SPLEEN

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THE purpose of this paper is to add to the literature two more cases of rupture of an apparently normal spleen occurring in individuals from whom no definite history of trauma could be obtained.

Spontaneous rupture of the normal spleen has been reported in approximately thirty-six cases. In 1937 Zuckerman and Jacobi reviewed the twenty-eight cases in the literature and accepted twenty-one of them. Since 1937, eight papers containing case reports have appeared.

Spontaneous rupture of diseased spleens occurs and is reported more frequently. The literature reveals that such ruptures have taken place in patients who have had malaria, typhoid, leukemia, portal thrombosis, Banti's disease, infectious mononucleosis, splenic infarct, puerperal sepsis, relapsing fever, pneumonia and typhus. These pathological states have caused the development of splenomegaly and soft boggy spleens which have been the basis for the ruptures. Hemangioma of the spleen has resulted in spontaneous rupture also.

Delayed hemorrhage from traumatic rupture of the spleen constitutes another category of extraordinary splenic hemorrhage. Zabinski and Harkins reviewed the literature in 1943 and collected 177 cases of delayed splenic rupture and hemorrhage and added four of their own. They estimated that 14 per cent of traumatic rupture of the spleen were of the delayed variety. These cases all have a connected and definite history of trauma.

CASE REPORTS

CASE 1. A thirty-five-year old, white American soldier entered the Station Hospital, Grenier Field, Manchester, N. H., at 6:30 A.M., February 12, 1943, with the chief complaint of abdominal pain of nine hours' duration. On the evening of the day before admission he began to have a steady non-radiating pain in the left side of the abdomen slightly below the level of the umbilicus. There were frequent exacerbations of the pain. He was unable to sleep during the night, was nauseated, and felt as though he needed to move his bowels. He tried to move his bowels several times and could pass neither feces nor flatus. At 5:45 A.M., while trying to defecate, he had a sudden acute, severe exacerbation of the pain which caused him to cry out and roll about in great agony. An ambulance was called and he entered the hospital.

There were no urinary symptoms. His bowels had been regular, and moved usually two to five times a day, soft formed stools. He was said to be a voracious eater and his soldier mates insisted he had food poisoning from eating enormous quantities of unusual combinations. It was stated that he did not use alcoholic beverages.

There was no history of food discomfort or abdominal pain. The patient stated, however, that eight years previously and again two years previously he had had similar attacks relieved finally by little white pills his doctor gave him. They made his bowels move, he stated, and this relieved the pain.

There was no history of trauma, weight loss, or relevant past, family or system history. He had gained steadily in weight for several years and at time of entry weighed 225 pounds.

The patient was seen at once on entry to the emergency floor. He was rolling and twisting on the litter and crying out almost hysterically with pain. He was a short (5 feet 5 inches) obese man, thirty-five years old. His skin was of good color, warm and dry. There was no indication from the patient's general appearance that he was suffering from a serious or catastrophic lesion.

The general examination was not remarkable; the positive findings were located in the abdomen. There was prominence without dis-

tention. The left side of the abdomen was moderately tender especially just below the level of the umbilicus. There was voluntary muscle spasm in this area and mild rebound tenderness. No masses or organs were felt. No evidence of fluid in the abdomen could be made out. Peristalsis was present but diminished. Over the ninth rib in the left midaxillary line was a small faint ecchymotic area. He was again asked about trauma and denied having sustained any. Rectal examination was negative.

Blood pressure was 120/80, pulse 90, temperature, 99.0°F., respirations were normal and not painful.

Because the patient was complaining so severely of pain, and evidence sufficient to consider surgical intervention was not present, the patient was given morphine, gr. $\frac{1}{6}$, and atropine gr. $\frac{1}{150}$. Intestinal obstruction, renal calculus, pancreatitis, diverticulitis, perforated ulcer and vascular accident were considered as possibilities. He was observed and studied for ten hours. His red blood count was 4,200,000; 85 per cent hemoglobin; 8,300 white blood count; 69 per cent polymorphonuclears; was normal. Flat plates of abdomen in various positions were negative as was an intravenous pyelogram.

He was partially relieved by the morphine. He did not appear acutely ill during most of the period of observation. However, his abdominal pain continued and the tenderness spread upward, across the abdomen, and he complained of pain on breathing, especially on top of the left shoulder. His blood pressure and pulse remained the same. His temperature rose to 99.6°F. The white count nine hours after admission was 14,000 with 77 per cent polymorphonuclears.

It was believed that he had a spreading peritonitis and that exploration was indicated. Twenty hours after onset of pain, under spinal anesthesia, a left transverse incision just above the umbilicus was made. On entering the peritoneal cavity a large quantity of blood was encountered. Exploration revealed the spleen to be enlarged. The exploring hand brought forth old clots from the region of the spleen thus making the probable diagnosis. The incision was enlarged and the spleen removed. It was approximately three times normal size and had an old, large subcapsular hematoma which had ruptured. It was estimated that there were 1½ to 2 liters of blood in the abdomen. The patient was given blood during and after the operation. Except for a mild wound complication and a short postoperative period of atlectasis, the convalescence was very satisfactory.

Pathological examination was as follows: Formalin fixed spleen 13.0 by 9.5 by 6.0 cm., weight 411 Gm. Capsule is slightly torn at anterior edge near lower pole. The denuded area measures 3.0 by 1.0 cm. Adjacent to the tear in the capsule is a dark blue-gray hematoma approximately 3.0 cm. in diameter. The remainder of the capsule is smooth and does not appear damaged. Sectioning reveals a layer of blood clot 0.4 to 0.2 cm. in thickness beneath the capsule, forming the hematoma. Beginning at the lower pole and immediately adjacent to the hematoma, the pulp contains a partly encapsulated, soft, reddish-black blood clot 2.0 by 2.5 cm. in diameter. It extends toward the upper pole of the spleen, increasing to a maximum diameter of 4.0 cm. in the middle of the spleen. The clot is approximately 9.0 cm. long. It does not extend into the upper quarter of the splenic pulp. Microscopic: Large amount of blood is found within splenic pulp just below the capsule. It extends toward the central portion. The sinuses within the pulp about the hemorrhage are dilated. The splenic pulp is otherwise not remarkable. Diagnosis: Hemorrhage of spleen, probably traumatic.

Blood studies revealed no evidence of malaria or blood dyscrasia. Careful questioning revealed no previous illness that might have given rise to a diseased spleen. Further, the question of trauma was again carefully gone into. All that could be obtained was the information that he had slipped and fallen on the ice several times during the winter which experience he had had every winter. He could recall no incident of injury to the left chest or abdomen or any fall which was followed by discomfort. Especially was he questioned regarding abdominal discomfort, weakness and shoulder pain prior to the onset of the acute illness.

It may be noted that in spite of the extensive intra-abdominal bleeding, the patient's appearance at no time suggested this. The clinical findings were rather those of spreading peritonitis. This florid individual apparently was able to lose considerable blood without giving rise to a picture of acute anemia.

The patient was discharged six weeks postoperatively to convalescent leave. Except for postoperative ventral hernia repair he has remained well.

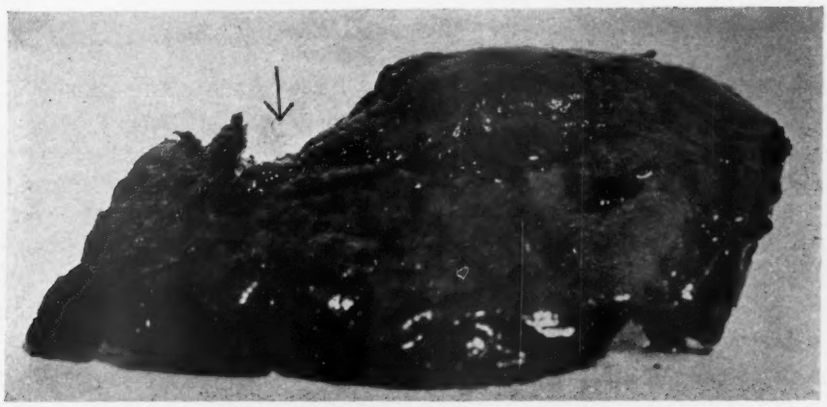

FIG. 1. Spleen from Case II with arrow pointing to rupture of right superior posterior border.

CASE II. A forty-nine-year old Colonel entered the Station Hospital, Fort Monroe, Virginia, with abdominal pain of four hours' duration. The clinical picture was typical of a perforated peptic ulcer. In addition he had evidence of a moderate degree of bronchitis. For the past year he had had vague epigastric pain with occasional vomiting and a loss of 20 pounds in weight. The pain was periodic and slightly relieved by food. For the week previous to hospital entry, the pain had been almost constant, more severe, and relieved only by alkalies. He had vomited several times daily during the week. He was operated upon shortly after entry under spinal anesthesia. A perforated ulcer on the anterior aspect of the duodenum was found and closed by simple suture and reinforced with omental tissue. The readily available stomach and duodenal contents were aspirated and the wound was closed without drainage. During the operation, the splenic area was not invaded in any way.

The immediate postoperative course was smooth except for moderate retained secretions and bronchitis. The temperature and pulse did not rise above 100°F. Peristalsis became normal within two days. The patient was able to take an ulcer diet without difficulty.

On the fifth postoperative day, shortly after the noon meal, the patient felt nauseated and vomited a small amount of food. He felt well otherwise until an hour later when he suddenly became very weak and complained of pressure in the epigastrium. A physician found the patient in severe shock. He was pale, cold, and clammy. The radial pulse was regular, rate 100, but rarely perceptible. The blood pressure was 70/40 in both arms. There was no evidence of difficulty in breathing and no chest pain. Chest examination was not remarkable. Abdominal examination revealed some upper abdominal distention and tympany. Peristalsis was audible but diminished. There was no abdominal tenderness. The wound was inspected and was not remarkable except for some induration and serous discharge about the stay sutures. Examination of extremities was negative for evidence of phlebothrombosis. He was given morphine, plasma and oxygen. A Levin tube was passed. No evidence of gastric stasis was obtained.

Following the administration of 500 cc. of plasma the blood pressure rose to 90/60, but it fell again to a systolic pressure of 60 mm. of mercury in a very short time; 500 cc. of citrated blood were given and again the pressure rose only to fall as soon as the blood had run in. These findings and the increasing pallor made it apparent that the patient was bleeding. It was believed that a co-existing posterior duodenal ulcer was the most probable source of the hemorrhage. Because of the uncertainty of diagnosis, the patient's recent surgery, bronchitis, and foremost of all, his alarming condition, it was believed that surgical intervention was not indicated. It was decided to rely on repeated transfusions until the patient's condition became stabilized.

During these early hours the patient remained conscious and rational. There presented no evidence of pulmonary embolus, massive collapse or coronary occlusion. An

electrocardiogram prior to surgery had been normal.

During the eighteen-hour period after the onset of this catastrophe, the patient required 6 liters of blood to maintain a pressure of 80/50. Any attempt to reduce the amount or speed of administration resulted in the blood pressure falling to an unobtainable level.

The day following the onset, signs of a high left diaphragm were noted with increased dullness corresponding to the left subphrenic space. The patient's general condition was improved. He was no longer clammy and cold and his condition appeared to have become stabilized. His abdomen was distended and peristalsis absent. No evidence of free fluid in the abdomen could be made out. There was no nausea or vomiting. He complained of slight fullness in the epigastrium. During the night he had spoken of an ache in his left shoulder.

In view of the large amount of blood he apparently had lost, the absence of hematemesis or blood in his rectum, it was thought that he may have been bleeding into the left subphrenic space from a ruptured spleen. He was questioned regarding trauma, malaria and other disorders but denied them all.

During the next four days he was given between 750 and 1,000 cc. of blood daily. His condition, appearance, blood pressure and pulse remained stabilized. His red blood count and hemoglobin rose slowly from 2.6 mil. and 65 per cent to above 4.0 mil. and to 90 per cent. His urinary output increased and his cough improved. He presented signs of a huge left subphrenic collection. However, his abdomen continued to show no evidence of free fluid. At the end of this time, his bowels moved several times and the stools showed no evidence of blood. *X*-rays of chest and abdomen revealed a very high left diaphragm and increased soft tissue density beneath the left diaphragm, and the splenic and transverse colon gas shadows were displaced downward. A diagnosis of ruptured spleen had been entertained and now was considered positive. The plan was to observe him carefully being ready to operate at once at the slightest suggestion of further bleeding. It was considered that every additional day of preparation would permit the patient's general condition to improve.

On the sixth day following his collapse, fall in blood pressure to 80 mm. of mercury and sudden perspiration indicated that further bleeding was probably taking place. Accordingly, preparations for immediate operation were made. Intravenous needles were placed in an ankle and an arm vein and administration of citrated blood and plasma was started. Spinal anesthesia, 100 mg. metycaine, was given.

The abdomen was opened through a left rectus muscle splitting incision. A small amount of free blood was seen in the peritoneal cavity. The omentum and transverse colon were found tamponading a huge collection of blood in the left subphrenic space. It was estimated that 8 liters of blood and clots were present. This was removed by mopping and suction. A ruptured spleen was removed.

Postoperative convalescence was smooth and without incident except for moderate infection in the right abdominal wound.

The patient received 12 liters of blood in all without reaction. He has remained well to date. Careful investigation has failed to reveal any history of trauma, illness, or any evidence of blood dyscrasia.

Examination of the spleen revealed it to be of normal size. There was widespread elevation of the capsule from the spleen proper with old clot present beneath the capsule. A one-inch laceration of the right superior posterior border was present. No organized clot was noted. Microscopically, the architecture was preserved and the follicles were solidly normal in appearance. The central arterioles showed a moderate degree of mural thickening. The pulp was markedly cellular and the sinusoids contained a variety of nucleated cells including eosinophiles, polymorphonuclears, lymphocytes, and monocytes, and there was prominence of littoral cells. There were occasional mitotic figures. The pathologist stated that the histologic appearance of the spleen was not conducive to a definite diagnosis. His diagnosis was: (1) Hyperplasia of splenic pulp; (2) laceration of spleen.

COMMENT

The pathological anatomy of delayed splenic rupture has been well described. Two types of situations may be obtained. In one a perisplenic hematoma together with omentum may stop the bleeding before a serious loss of blood occurs. At a later date, softening of the splenic pulp

along with liquefaction of the hematoma permits sudden severe hemorrhage. In this type of case the latent period is usually marked by epigastric distress, nausea, dull pain in the left upper quadrant, left shoulder pain, diarrhea and weakness. In the second type, injury gives rise to a subcapsular hematoma which enlarges until the tension is sufficient to create a rupture of the capsule with a resultant sudden severe hemorrhage. In the presence of a subcapsular hematoma, the softness and vascularity of the spleen brings about a progressive lesion. Consequently, when the capsule ruptures, the soft pulp of the spleen gives rise to fresh rapid bleeding. The subcapsular fracture which originally caused the hematoma has been enlarged by the hematoma and it appears at time of surgery as a definite rupture. This type of case may have no symptoms whatsoever during the latent period and the injury may have passed from the patient's memory. The patients are reported, then, with sudden onset of symptoms without the slightest warning.

In Case I, during convalescence a history of falls on the ice as occurred every winter, was obtained, though no definite incident or injury to chest or abdomen could be recalled. It is entirely probable that a subcapsular hematoma occurred at the time of one of these falls.

In Case II, no injury of any sort was ever recalled. The patient had had some vomiting and cough prior to the perforation of the ulcer. After the operation for the perforation, the cough continued to a considerable degree. It is possible that the injury to the spleen may have occurred from this indirect violence, or the patient may have forgotten some direct trauma. An adhesive peritonitis about the spleen may have resulted from the perforated ulcer and the cough may have torn the capsule or spleen initiating a subcapsular hematoma. It is probable that spontaneous splenic rupture is the result of subcapsular hematoma following some slight and forgotten or unnoticed trauma. Since no history of trauma was obtainable in these cases, they were to all practical purposes, spontaneous ruptures.

Diagnosis of splenic rupture may be fairly obvious or exceedingly difficult. Consideration of it as a possibility is a most important step. Kehr's sign, pain on top of the shoulder, is frequently present. Ballance's sign of shifting dullness in the right flank and dullness in the left flank which does not shift, may be present. Koucky has called attention, as have others, to the fact that fracture of the lower left ribs should put one on guard, for association of ruptured spleen and such fractures is not infrequent. *X*-ray examination may be very helpful. Upward displacement of the left diaphragm, displacement of the stomach to the right and the colon downward may be revealed, as well as increased soft tissue density in the left subphrenic space. Abdominal paracentesis may reveal blood or the blood may be loculated under the left diaphragm, thereby giving a negative tap. Abdominal tenderness and spasm centered in the left upper quadrant, evidence of hemorrhage, leukocytosis, and mild fever are common. The tenderness may be widespread with poor localization.

The two reported cases, and others in the literature indicate that the clinical picture may be predominantly one of hemorrhage or one of spreading peritonitis. Patients have been operated upon for acute appendicitis and perforated ulcer.

Since varying degrees of trauma are constantly being sustained, it is important to consider splenic rupture in any case which presents evidence of concealed hemorrhage or an atypical acute condition of the abdomen. A negative history regarding trauma does not rule it out.

SUMMARY

Two cases of rupture of the normal spleen occurring without definite history of trauma are reported.

So-called spontaneous splenic rupture probably results from a subcapsular hema-

toma following forgotten or unnoticed injury.

The importance of bearing this possibility in mind is pointed out, in view of high frequency of trauma in the present day. Particularly it should be watched for in patients receiving other more apparent and serious injuries.

REFERENCES

Abrams, Abram B. and Kauder, Warren G. Spontaneous rupture of the spleen complicating portal thrombosis. *Am. J. Surg.*, 66: 284–286, 1944.

Bailey, Hamilton. Traumatic rupture of the spleen. *Brit. J. Surg.*, 15: 40–46, 1927.

Bailey and Schreiber. *Am. J. Surg.*, Splenic ruptures. 66: 4–14, 1944.

Byford, William H. Spontaneous rupture of the normal spleen. *Arch. Surg.*, 20: 232–239, 1930.

Chi, C. K. Spontaneous rupture of the normal spleen. *Chinese M. J.*, 56: 374–378, 1939.

Connors, John F. Ruptured spleens. Spontaneous and subcutaneous. *Ann. Surg.*, 74: 1, 1921.

Dardinski, V. J. Spontaneous rupture of an apparently normal spleen. *J. A. M. A.*, 99: 831–832, 1932.

Darley, Ward, Black, William C. Smith, Charles, and Good, Frederick A. Spontaneous splenic rupture in infectious mononucleosis: a case and pathological report. *Am. J. M. Sc.*, 208: 381–384, 1944.

Deaver, J. Montgomery. Delayed hemorrhage following traumatic rupture of the spleen, with particular reference to roentgenologic findings. *Ann. Surg.*, 113: 477–480, 1941.

Dodd, H. Rupture of the spleen after trifling mishaps. *Brit. M. J.*, 3858: 1094, 1934.

Dubash, J. and Langley, G. F. Spontaneous rupture of abnormally mobile spleen. *Brit. M. J.*, 1: 183–184, 1944.

Dudgeon, H., Jr. Spontaneous rupture of the spleen. *South. M. J.*, 34: 1247–1249, 1941.

Greenfield, M. M. and Lund, H. Spontaneous rupture of the spleen in chronic myeloid leukemia. *Ohio State M. J.*, 40: 950–951, 1944.

Harkins, Henry N. Delayed splenic rupture: report of a case. *Am. J. Surg.*, 57: 159–161, 1942.

Hederich, H. and Paravisini, J. Spontaneous rupture of normal spleen. *Med. Clin., Barcelona*, 1: 326–329, 1943.

Jones, L. E. Spontaneous rupture of spleen apparently normal. *Brit. M. J.*, 2: 561–562, 1944.

Koucky, J. D. and Van Demark, R. E. The syndrome of rib fracture followed by delayed rupture of the spleen. *Rocky Mountain M. J.*, 41: 732–734, 1944.

Leighton, William E. Spontaneous rupture of the malarial spleen, with abstract of cases reported between 1842 and 1921. *Ann. Surg.*, 74: 13–19, 1921.

Lommen, Ralph G. Delayed rupture of the spleen (discussion and case report). *Illinois M. J.*, 81: 135–139, 1942.

McCarthy, A. M. and Knoepp, L. F. Spontaneous rupture of spleen: 2 cases. *Am. J. Surg.*, 65: 413–415, 1944.

McLachlin, Angus D. Spontaneous rupture of a normal spleen; case report. *Ann. Surg.*, 117: 476–479, 1943.

Nixon, P. I. Spontaneous rupture of the normal spleen. *J. A. M. A.*, 96: 1267, 1931.

Pringle, S. Notes on a case of spontaneous rupture of a spleen. *Irish J. M. Sc.*, 329–330, 1931.

Puestow, Charles B. Traumatic rupture of the spleen with delayed hemorrhage. *Surg. Clin. North America*, 20: 195–205, 1940.

Russ, S. E. and Gaynor, J. S. Spontaneous rupture of a malarial spleen. *J. A. M. A.*, 127: 758, 1945.

Shannon, W. F. Spontaneous rupture of the spleen complicating labor. *Am. J. Obst. & Gynec.*, 40: 323–327, 1940.

Watson, J. R. and Ferdeber, M. Spontaneous rupture of the normal spleen. *J. A. M. A.*, 120: 690–691, 1942.

Wright, Louis T. and Prigot, Aaron. Traumatic subcutaneous rupture of the normal spleen. *Arch. Surg.*, 39: 551–576, 1939.

Young, Ralph H. Spontaneous rupture of a normal spleen. *Ann. Surg.*, 101, 1389–1392, 1935.

Zabinski, Edward J. and Harkins, Henry N. Delayed splenic rupture: a clinical syndrome following trauma; report of four cases with an analysis of one hundred and seventy-seven cases collected from the literature. *Arch. Surg.*, 46: 186–213, 1943.

Zuckerman, Charles and Jacobi, Mendel. Spontaneous rupture of the normal spleen. *Arch. Surg.*, 34: 917–928, 1937.

AVULSION INJURIES INCLUDING TWO CASES OF AVULSION OF THE SCALP*

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THE treatment of complete avulsion injuries involving the skin frequently can be carried out by using the avulsed skin to cover the defect. This becomes important when large defects are present such as the scalp. The only alternative to this method of treatment is the application of skin grafts; however, the principle is the same as the avulsed skin is converted to a fine thickness graft before being reapplied.

The method of treatment consists in recovering the avulsed skin as soon after the accident as is possible. It should be handled very gently to prevent further trauma and kept moist to prevent drying. A cool solution of physiological saline is used advantageously upon entry to the hospital to keep the skin moist. In conveying the skin to the hospital sterile gauze that is moistened can be used. We believe that cooling decreases the metabolism and thereby increases the time of viability. This concurs with the opinion of Brooks and Duncan[1] that lower temperature increases the survival time of anemic tissue. The avulsed skin is then examined and the extent of trauma is determined. If the skin is crushed, white and devitalized, it cannot be used. However, if the skin appears healthy and viable, it is then prepared for covering the defect.

The preparation of the skin is all important and the success of this method of treatment is entirely dependent upon the thoroughness with which this step is carried out. The subcutaneous fat and tissue are meticulously removed from the skin. This is performed with a razor or sharp scalpel using sharp dissection. It is very important that all fat and subcutaneous tissue be removed so that the derma is exposed. The skin is kept moist and cool with the physiological saline during this procedure. After this the skin is ready to be transferred to the avulsed surface. The traumatized area is prepared by débridement and cleansing with physiological saline. All bleeding is controlled and any devitalized or necrotic tissue is removed so that a good base is made to apply to the skin. The skin is then sutured over the traumatized area in the same manner as a full thickness graft. The skin may require trimming to conform to the contour of the defect and must be made to fit snugly without overdue tension. This method of preparing the skin has been described by E. L. Keyes,[2] Alfred W. Farmer,[3] and P. H. Jayes.[4]

CASE REPORTS

CASE I. Mrs. L. M. T. was admitted to the hospital by ambulance on May 11, 1943, at 8:30 A.M. She gave a history that while at work her hair became entangled in a fly wheel and tore off her scalp. Examination revealed a total avulsion of the scalp including the right eyebrow and upper half of the right auricle. There was also an extensive laceration just lateral to the left eye that extended down to the zygoma with considerable undermining of this area. The police were sent to retrieve the scalp and returned in an amazingly short time with the coveted missing part. Upon examination the scalp was found to be intact and in good condition except for one area on top which was torn and crushed. The viability of this area seemed doubtful to us. The weather man offered a damp day so there was little dryness to the scalp. The patient's general condition was good so she was

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taken to surgery. The scalp was moistened with cool physiological saline and kept so. Preparation of the scalp was first started by placing it over an inverted bowl and shaving all the hair. Following this it was inverted and the preparation completed by removing all fat and subcutaneous tissue down to the derma. Due to the large area this preparation required two hours and ten minutes. All the time the scalp was kept at a lowered temperature by irrigating with cool physiological saline. The head was prepared by removing all dirt with soap and water. Bleeding was controlled and all devitalized and necrotic tissue excised and the whole area irrigated with physiological saline. The scalp was then sutured into its anatomical position around the borders. It was then discovered that the removal of the subcutaneous tissue prevented its snug fit. In order to remedy this two triangular areas were cut out on top and these were sutured in a straight line. This afforded a snug fit and a grease gauze dressing was applied.

The patient made an uneventful recovery and after forty-four days most of the scalp remained viable although an area on top of the head sloughed off. This corresponded to the area that was macerated and also to the area excised to make the scalp fit snugly. On the forty-fourth day split thickness grafts were taken from the right thigh and sutured in place on top of the head. She made an uneventful recovery and after about seventy days was ready for a transformation. It is of interest to note that the right eyebrow grew back and also some hair on the sides but none on the top. The skin over the scalp was soft and pliable. The recovery was entirely uneventful and she has an excellent cosmetic result.

Fig. 1. Case 1. The scalp as it was retreived by the police.

Case II. Miss M. E., age twenty, entered the hospital July 12, 1944, with a history that her hair became caught in some large rollers and pulled off most of her scalp. Examination revealed an avulsion of most of her scalp and forehead. In one area the periosteum was exposed. The police were dispatched and retrieved the scalp. The scalp was found to be intact with only some maceration on the top. The patient's general condition was good so she was taken to surgery. The same procedure was followed as in Case 1. The scalp was kept cool with physiological saline and the hair shaved off. Then all the fat and subcutaneous tissue was removed by sharp dissection to the derma. It was then sutured in place and adjustments

FIG. 2. Case 1. Appearance at first dressing five days after accident. Note loss of upper half of right auricle.

FIG. 3. Case 1. Fifth day after accident showing front view.

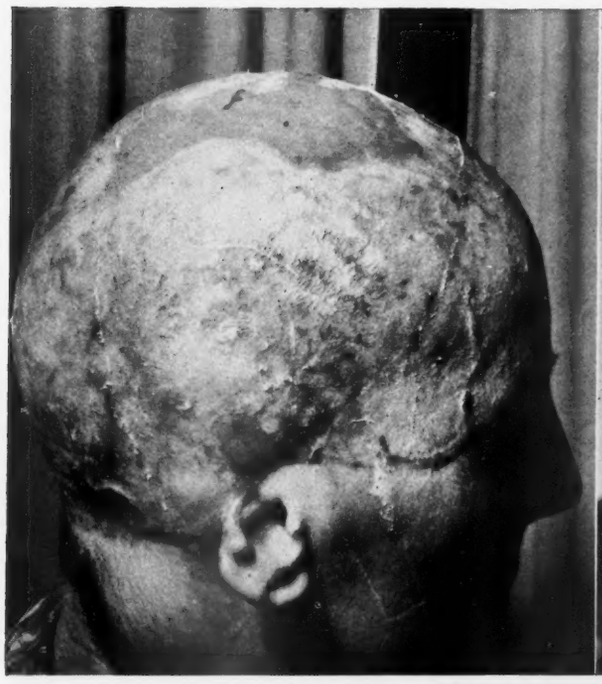

FIG. 4. Case 1. Forty-four days after accident showing the amount of scalp remaining viable.

FIG. 5. Case 1. Front view showing end result.

made to have a snug fit. A grease gauze dressing was applied.

The patient made an uneventful recovery and by August 16, 1944, most of the scalp was viable except on the top which sloughed. On August 16, 1944, an attempt was made to skin graft the remaining area but before the operation was completed the patient went into shock and had respiratory difficulty and the operation was not completed satisfactorily. On September 16, 1944, another operation was performed and the remaining area which was small was covered with split thickness grafts. She made an uneventful recovery and was discharged from the hospital September 30, 1944. One small area on the top did not heal over and on November 18, 1944, another small split thickness graft was placed on this area. Following that the scalp was all healed. She has an excellent cosmetic result. No hair grew out and she wears a transformation.

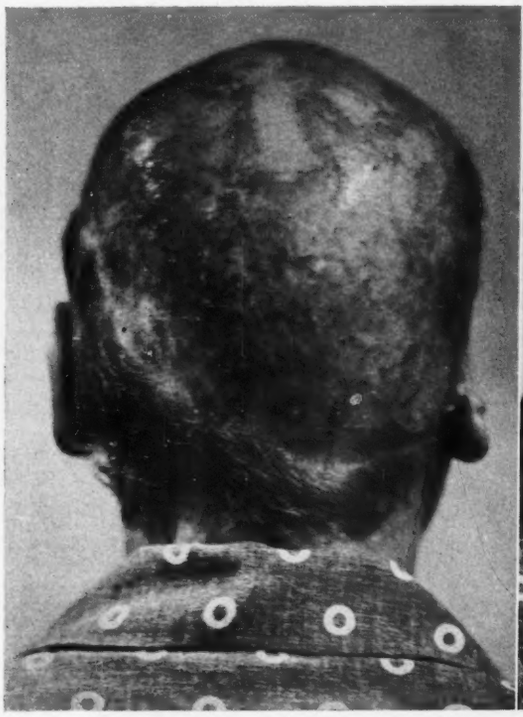

FIG. 6. Back view showing end result.

FIG. 7. Case 1. End result as viewed from right side.

CASE III. Mr. A. M., age fifty-two, entered the hospital May 21, 1943, on the service of Dr. E. L. Keyes with a history that about 8.00 A.M. he playfully pushed his way with some comrade through a door. The door slammed onto his index finger leaving the skin stuck to the door frame. The police were dispatched to retrieve the skin of the finger which they did. They found the skin on a clean piece of paper where his fellow workers had thoughtfully placed it. On arrival at the hospital, the skin was transferred to a sterile basin containing physiological saline at room temperature. The skin which of course was completely avulsed contained fat on its deeper surface. It measured 1.1 by 1.1 cm. The tip of the finger was clean with the phalanx visible in the wound with its periosteum unruptured and intact. Someone unknowingly placed some contaminated sulfanilamide powder on the tip. The skin was prepared by excising all the subcutaneous tissue, fat and blood vessels with sharp dissection. Then with clean instruments a débridement of the base of the finger was performed and all sulfanilamide removed. Hemostasis was controlled by gentle pressure with a wet sponge on the base of the wound. The avulsed skin was placed on its base with fingerprints running back into the normal parts. It was sutured with black silk. In one week all sutures were removed and on June 14, 1943, desquamation was present but the pores remained viable. On June 28, 1943, there was a loss of 3 mm. but no pores and the entire area was healed. The final result was a well functioning finger.

Case IV. O. L. A., a ten-year old white male, entered the hospital on the night of November 22, 1943, with a history of having been pushed through a store window thirty minutes previously. Examination at that time was essentially negative except for immediate trauma. There was a small abrasion of the upper lip and also a laceration about one-half inch in length at the angle of the left scapula. The right knee had a laceration on its medial aspect one and one-half inches in length and parallel to the upper border of the patella. This had partially severed the quadriceps femoris tendon. There was also an area two and one-half by three inches in diameter just over the lower half of the patella from which the skin had been completely avulsed. The deep fascia was exposed and in the upper edge of the wound the periosteum was exposed beneath the prepatellas bursa. There was no active bleeding. The avulsed tissue was left at the scene of the accident. Police retrieved the tissue finding it on the sidewalk at the base of the window (it was raining). In the operating room and under local anesthesia the tendon and laceration were sutured by Dr. Wiege, resident surgeon. The site of the avulsion was cleansed thoroughly with soap and water. The avulsed tissue was prepared by removing all fat, fascia and subcutaneous tissue down to the derma. This was performed with sharp dissection. The avulsed skin was then sutured in its normal place with silk sutures. Vaseline gauze with sulfathiazole powder and a pressure dressing applied. A posterior cast from the thighs to the toes was applied. On the sixth postoperative day the

Fig. 8.

Fig. 9.

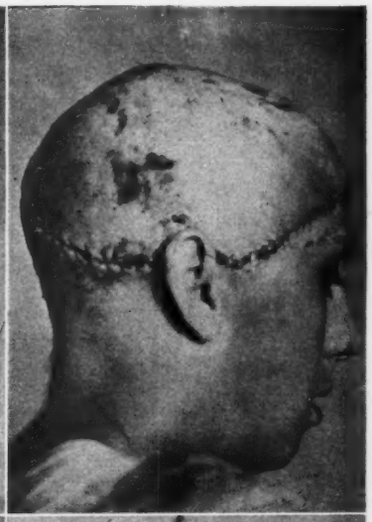

Fig. 10.

Fig. 11.

Fig. 8. Case II. Fifth day after accident as viewed from the front.
Fig. 9. Case II. Fifth day after accident as viewed from right side.
Fig. 10. Case II. End result as viewed from the front.
Fig. 11. Case II. End result with patient wearing a transformation.

sutures were removed and the patient was discharged with a cast. The tissue grew in place and a good result was obtained with functioning skin.

FIG. 12. Case III. This shows the traumatized finger and the loss of tissue.

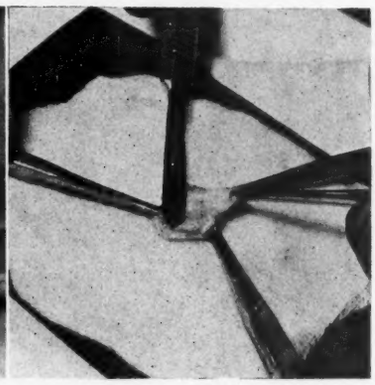

FIG. 13. Case III. The avulsed tissue and showing the method of preparing the skin.

CASE V. Mr. R. F. entered the hospital on July 16, 1943, with a history of trimming corn with a knife at a market and cutting off the distal end of his right index finger. Examination

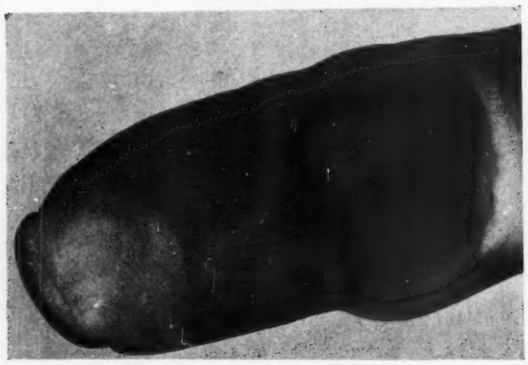

FIG. 14. Case III. End result showing the good functioning result.

revealed a complete avulsion of the tip of the finger on the volar surface 3 cm. in length. Dr. Mitchel Johnson, resident surgeon, then prepared the avulsed tissue by removing all fat and subcutaneous tissue down to the derma. The traumatized area was cleansed with physiological saline and débrided. The skin was sutured in place with interrupted silk sutures and a vaseline gauze dressing applied. The sutures were removed on July 23, 1943, and on the twelfth postoperative day the dressing was removed. All of the tissue remained viable and the patient had a well functioning finger.

LITERATURE

From a review of the literature it was found that avulsions of the scalp are very unusual. Cahill and Caufield,[5] in 1938, made an extensive review of the literature and the various methods used in the application of grafts to the scalp. It was generally agreed that grafting of skin formed the most successful way of treating these cases. Davis,[7] in 1911, reported that the scalp was replaced in one piece in twenty-one cases and in all but one case there was a total failure. According to Davis, in 1898 Malherle reported a case of scalp avulsion in which the scalp was shaved and cleansed with sublimate solution (1:1000) and replaced with forty sutures. Eight drains were used. The scalp died, but was converted into a parchment like covering or dressing of skin adherent to the cranium, under which healing occurred without complications. In 1922, McWilliams[6] stated that he found forty cases in the literature in which the scalp had been replaced and in not a single instance did the scalp live.

In 1938, Alfred W. Farmer reported four cases of skin avulsion in which the skin was prepared like full thickness grafts and replaced. He states that this type of repair gives a better result than can be obtained with partial thickness grafts applied at a later date.

P. H. Jayes, in 1942, recorded a case in which a large area of skin was avulsed from a boy's thigh. The skin was repaired in the manner described and replaced. He obtained an excellent result.

E. L. Keyes, in 1942, reported a case in which the skin from the dorsum of the middle phalanx of a finger was completely avulsed. This was prepared and replaced and a remarkable result was obtained with a complete take of the skin.

COMMENTS

There are advantages in replacing avulsed skin in certain cases. It is a procedure which is not complicated and can be performed by surgeons that are not skilled in skin grafting. In the replacement of the scalp in Case 1, it is of interest to note that the eyebrow grew out and a little hair although the amount of hair was so small necessitating the patient to wear a transformation. Another advantage is that it saves damaged tissue and skin from certain death. If all of the avulsed skin does not remain viable, the area to be skin grafted later is smaller. It has also been found that replaced skin is useable. This is examplified by the finger tips which were replaced.

CONCLUSION

1. Two cases of avulsions of the scalp are presented and the method of treatment is discussed.

2. Replacement of avulsed skin can be used to advantage by properly preparing the skin as a primary treatment for wounds in which a loss of tissue is evident.

REFERENCES

1. Brooks and Duncan. Influence of temperature in wounds. *Ann. Surg.*, 114: 1069–1075, 941.
2. Keyes, E. L. Graft in situ of skin completely avulsed. *J. Missouri M. A.*, 37: 75–76, 1940.
3. Farmer, A. W. Treatment of avulsed skin flaps. *Ann. Surg.*, 110: 951–959, 1939.
4. Jayes, P. H. Immediate replacement of avulsed soft tissue. *Proc. Roy. Soc. Med.*, 35: 343–344, 1942.
5. Cahill, J. A. and Caufield, P. A. Complete avulsion of scalp, loss of right ear, reconstructed by peduncalated tube grafts and costal cartilage. *Surg., Gynec. & Obst.*, 66: 459–465, 1938.
6. McWilliams, C. A. Principles of four types of skin grafting with an improved method of treating total avulsions of the scalp. *J. A. M. A.*, 83: 183–189, 1924.
7. Davis, J. S. *Jobns Hopkins Rep.*, 16: 257–362, 1911.

BILATERAL RECURRENT INTERCARPAL SUBLUXATION

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ONE of the unusual causes for painful snapping or clicking of the wrist is a recurrent subluxation in the intercarpal region.[4] We recently encountered two such instances, in each of whom the condition was bilateral and was not the result of trauma. In these two cases the subluxation was repeatedly produced by strong active flexion of the fingers or hands. While the "snap" was one of the chief complaints, swelling and weakness of the wrists were also frequent complications. In the two following cases, clinical and radiographic findings as well as a follow-up of a surgical procedure are presented.

CASE REPORTS

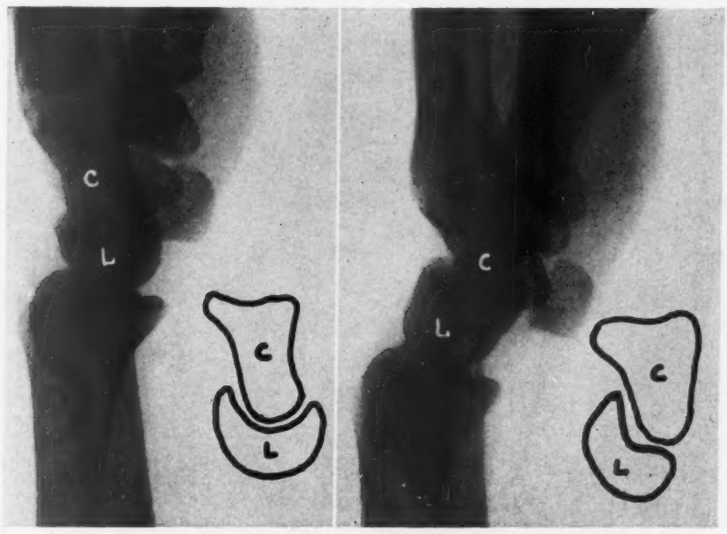
CASE 1. A male, aged twenty, had complained of recurrent pain, swelling and clicking of the left wrist for the past three years without suffering any recent or previous trauma to his part. The patient stated that whenever he attempted to make full use of his left hand as in the performance of his routine duties, an audible click was produced in the left wrist. This had occurred several times a day and was complicated by the presence of pain and swelling in the wrist. In spite of the patient's precaution to avoid these clicks, the swelling and pain had become progressively worse. On the right hand, the click was first noted one year before. Since then it had recurred infrequently. The patient could not ascribe any definite cause for the onset of the symptoms in the right or left wrists.

Examination of the left wrist showed that the landmarks were normal except for a fullness in the "snuffbox" at the base of the metacarpal bone of the thumb. Strong active contraction of the flexor tendons of the fingers or hand caused the left hand to be temporarily displaced in a palmar and radial plane. This had produced an abnormal concavity on the dorsum of the left wrist. When this maneuver was performed, a loud click was produced in the wrist which could be heard clearly for a distance of about fifteen feet. This sound, but of a lesser intensity, could be readily reproduced by passive anterior translocation of the hand or by passive palmar flexion and traction of the hand. Frequent repetition of this test caused an increase in the effusion in the carpal area. The concavity on the dorsum of the wrist could be easily obliterated by replacing the hand into a normal alignment with the forearm. No hypermobility was noted in the distal radioulnar articulation. The range of passive dorsiflexion of the left hand was 60 degrees, 10 degrees less than that of the right hand. The greatest angle of passive palmar flexion of the left hand was 120 degrees, equal to that of the right. The power of the left hand, however, was approximately 25 per cent less than that of the right. An abnormal concavity on the dorsum of the right wrist as well as a click could be produced on active contraction of the flexor apparatus of the fingers or hand or by passive manipulation of the hand. Subsequent to such repeated manipulations, the right carpal region became mildly enlarged and tender to touch.

Radiographic examination made of both wrists in the neutral and dorsi and palmar flexed attitudes of the hands revealed that the carpal and metacarpal bones were normal in appearance. It was noted that when the "click" was produced by active flexion of the fingers or hand, the distal row of carpal bones and the contiguous metacarpal bones were partly subluxed toward the palmar aspect. In these radiographs one clearly observed that the convex surface of the lunate bone was partly rotated towards the dorsum and that the anteriorly displaced capitate bone was in a plane parallel to that of the metacarpal bones. (Fig. 1.) The subluxation in the intercarpal region was not fixed and could be corrected easily by manipulation as was observed by fluoroscopic examination of the wrists.

In spite of one year of conservative therapy which consisted mainly of temporary im-

mobilization and muscle training of the left hand and wrist, one observed that the subluxations in the left wrist had occurred more frequently and were accompanied by increasing pain and local effusion. Because of these complaints an arthrodesis was performed between the left capitate, navicular and lunate bones. Under brachial plexus block anesthesia, a horizontal incision was made from the region of the styloid of the radius to the capitate bone on the dorsal aspect of the left wrist. The common extensor tendons of the fingers and those of the thumb and the dorsal branch of the radial nerve were exposed and retracted. The dorsal ligament was cut in a cruciate fashion and the navicular, lunate and capitate bones were brought into view. By flexing the hand and applying slight traction towards the palmar surface, a palmar subluxation of the distal row of the carpal bones and of the contiguous metacarpal bones was seen. This subluxation caused a temporary fore-shortening in the length of the carpal region. Reposition of the carpal bones into normal alignment was done with great ease. The articular cartilages of the opposing surfaces of the navicular, lunate and capitate bones which were dull and fibrillated were resected in order to expose their subchondral zones. Slivers which were removed from the capitate bone were inserted into the joint space between the capitate, navicular, and lunate bones. The dorsal ligaments were coapted and the extensor tendons were replaced into their respective tendon sheaths. The subcutaneous tissue and skin were closed with catgut and silk, respectively. The left hand and forearm were immobilized in a plaster of paris bandage for a period of three months. The hand was held in an attitude of 20 degrees of dorsiflexion. Radiographic examination made three months after the operation revealed beginning fusion of the capitate, navicular and lunate bones. Subsequently on removal of the plaster of paris bandage, a three month course of hydrotherapy and exercises was given to the entire left upper extremity to strengthen the muscles of the forearm. It was noted that the arthrodesis had resulted in a diminution in the range of dorsi and palmar flexion and of radial and ulnar deviation of the left hand. This hand could now be actively and passively dorsiflexed through an arc of 15 degrees and palmar flexed through an arc of 35 degrees. Follow-up examination one year after the operation showed that the patient had been able to make full use of his



A B

FIG. 1. A, radiograph of lateral view of left wrist with hand in neutral attitude. In diagram, L is the lunate bone, and C is the capitate. B, radiograph of lateral view of same wrist, taken as the click is produced by strong active contraction of the flexor apparatus of the fingers or hand. Note the anterior subluxation of the capitate bone and attached metacarpal bones. The convex surface of the lunate bone is rotated towards the dorsum. In diagram, L is the lunate bone, and C is the capitate bone.

left hand without experiencing pain, clicking, or swelling of the wrist.

Radiographic examination made six months and repeated one year after the operation revealed that a fusion had occurred between the left capitate, navicular, and lunate bones. (Fig. 2.) No subluxation was present in the intercarpal region either on active or passive palmar or dorsiflexion of the left hand or on active flexion of the fingers.

FIG. 2. Radiographs of left wrist taken six months after the intercarpal arthrodesis. Note the obliteration of the joint spaces between the capitate, navicular and lunate bones.

Recently this patient had requested that a similar operation be performed on the right wrist, but because of the infrequent occurrence of the click and subluxation on this side, surgical treatment was not advised.

CASE II. A male, aged twenty-one, had complained of pain, swelling and clicking of the wrists, the right more frequently than the left, for the past eleven years without experiencing any antecedent or recent trauma to these parts. The click usually occurred during strong active contraction of the flexor apparatus of the fingers or hands. Because of the increasing number of episodes of swelling and pain in the right wrist, the patient sought medical advice.

On examination it was noted that the range of dorsi and palmar flexion of the hands was within normal limits. A click could be produced in either wrist by active flexion of the fingers or hands, by passive anterior translocation, or by passive palmar flexion and traction of either hand. When the click was produced a definite abnormal concavity was observed on the dorsum of the wrists. Radiographic examination of the right and left wrists and hands made as the click was heard revealed a bilateral anterior partial subluxation of the distal row of carpal and contiguous metacarpal bones. The carpal and metacarpal bones were normal in appearance. The subluxations could be easily corrected by gentle manipulation. This patient was transferred to another military installation before treatment could be initiated.

COMMENT

As a basis for this investigation, we reviewed the radiographs of twelve pairs of normal wrists to observe the relationship of the carpal bones in the neutral, dorsi flexed and palmar flexed attitude of the hands. With the metacarpal bones in a strict neutral vertical attitude the lunate bone was not displaced dorsally or ventrally and the axis of the capitate bone was parallel to that of the metacarpal bones. On active palmar flexion of the hand, the capitate bone rotated almost to the horizontal plane towards the palmar surface while the lunate bone rotated exposing its convex surface towards the dorsum. On active dorsiflexion of the hand, the capitate bone was tilted toward the dorsum and the lunate bone was rotated exposing its convex surface towards the volar aspect. On

dorsi and palmar flexion of the hand, the navicular bone rotated in the same direction as the lunate bone.[1,2,3] These studies revealed, first, the normal wide range of mobility in the intercarpal area, and second, the absence of any true intercarpal subluxation during normal movements of the hand.

In addition we examined clinically the wrists of 200 young male adults and we have noticed that minimal passive anterior translocation of the hand at the midcarpal region is a normal finding and that a faint click could be inconstantly produced by this maneuver. Furthermore, radiographic examination of the wrists of twelve patients in this group confirmed the clinical finding that minimal anterior subluxation of the distal carpal bones could be produced by passive anterior translocation of the hand. This indicated that the intercarpal ligament was normally long enough to permit passive minimal anterior displacement of the carpometacarpal unit. We also had an opportunity to examine clinically the wrists of ten adults with generalized lengthening of the capsular and ligamentous structures, hypermobility of the bones, in which moderate passive palmar translocation of the hands could be produced.[5] Radiographs taken of these wrists as the hands were translocated showed a moderate palmar subluxation of the distal row of the carpal bones and attached metacarpal bones. In these instances the intercarpal ligament was "overlengthened" and readily yielded to the passive subluxation in the intercarpal region. Yet in the ten cases of generalized hypermobility of the bones as well as in the 200 normal ones, subluxation in the intercarpal region could not be initiated solely by active flexion of the fingers or hands. This suggested that in these cases the power of the flexor and extensor apparatus of the carpometacarpal unit was well balanced and prevented any intercarpal subluxation even in the presence of "overlengthened" ligaments.

On the other hand, it seems that in two cases in question, there probably was a relative diminution in the power of the extensor mechanism which permitted the flexor muscles and tendons to pull the carpometacarpal unit out of alignment. Therefore, we believe that the basis for the subluxation is, first, an "overlength" of the intercarpal ligaments and, second, an imbalance in the power between the flexor and extensor apparatus of the fingers and hands.

CONCLUSION

Two patients with snapping or clicking of the wrists are described in each of whom pain and swelling of these parts were caused by a non-traumatic, recurrent palmar subluxation of the distal row of carpal and contiguous metacarpal bones. This was initiated by strong active flexion of the fingers or hands. In one of these cases, because of the frequent episodes of pain and effusion in the wrist, an arthrodesis was performed between the left capitate, lunate and navicular bones. This had resulted in a fusion of these three bones with complete disappearance of the click, pain and swelling of the left wrist.

It seems that the basis for the recurrent intercarpal subluxation may be a localized "overlength" of the ligaments binding the carpal bones and an imbalance in the power between the flexor and extensor apparatus of the fingers and hands. The loss of the normal check mechanism of these ligaments had permitted an anterior subluxation of the carpometacarpal unit by the pull of the unopposed flexor apparatus of the fingers or hands.

REFERENCES

1. Bunnell, Sterling. Surgery of the Hand. Philadelphia, 1944. J. B. Lippincott Company.
2. Burman, M. S., Sinberg, S. E. and Gersh, W. Fractures of the radial and ulnar axes. *Am. J. Roentgenol.*, 51: 455–480, 1944.
3. Horwitz, Thomas. An anatomic and roentgenologic study of the wrist joint. *Surgery*, 7: 773–783, 1940.
4. Monchet, A. and Belot, J. Poignet a ressant. Subluxation medio-carpienne en avant. *Bull. et mém. Soc. nat. de chir.*, 60: 1243–1244, 1934.
5. Sutro, Charles J. Hypermobility of bones due to 'overlengthened' capsular and ligamentous tissues. (To be published.)

EMBRYOMA OF THE KIDNEY (WILMS' TUMOR)

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WILMS' tumor, a distinctive new growth of the kidney, is second only to neuroblastoma sympatheticum as the most likely diagnosis in a child, between a few months and three years of age, with a hard, painless abdominal swelling. However, although it is essentially a childhood condition it is on rare occasions discovered in an adult. In view of the fact that the microscopic analysis of this neoplasm consistently reveals its mixed cellular nature and histological structure most clinicians believe that the proper nomenclature for the disease should be either mixed tumor or embryoma of the kidney rather than Wilms' tumor. Incidentally, as far as the sexes are concerned it shows neither favor nor disfavor being fairly equally distributed among males and females. Similarly, it has no predilection for either the left or the right kidney.

Pathologically, this new growth always originates but never remains within the kidney, since unrecognized, sooner or later with remarkable speed and progress, it stretches the capsule to the breaking point to be disseminated rapidly into the surrounding locality and between contiguous structures, continuing to the point of filling the entire flank and half the abdomen. Usually it has a firm, hard, rubbery feel to it through the abdominal wall, and although the surface appears smooth it not too uncommonly may be notched or lobulated so that momentarily it may be confused with a possible splenomegalia. Usually upon exposure at operation it becomes quite obvious that the kidney structure and contour has become markedly distorted not by immediate infiltration but by pressure. In our own case it was remarkably so since the neoplastic tissue had actually projected into and obliterated completely the renal pelvis and had so invaded the hilum structures as to obstruct the lumen entirely of not only the renal vein, as is not uncommon, but the renal artery as well.

In the early stages of these cases and at a time when something really worthwhile could be done the clinical features are notoriously and characteristically absent. Unfortunately, not until it has gone through that insidious, treacherous silent state of development into a ready palpable, firm, painless mass or even eventually into a large tender painful swelling almost filling the entire flank is it usually recognized. Occasionally, as in the author's case, although the child may be fussy, pale, and "off its feeding" for several days (thought to be due to "teething," etc.) the enormous proportions the growth may reach before recognition are almost uncanny. Here it was in the process of a more or less cursory examination given prior to a contemplated inoculation for diphtheria and pertussis that a firm though tender mass was discovered projecting from beneath the left costal margin and bulging the left flank. With a systematic history one may casually obtain the information that for some little time the child may have gradually appeared pale, has been periodically feverish, and the urine has been occasionally "sort of rusty."

Nothing very conclusive nor convincing is derived particularly from the laboratory except from the *x*-ray studies; the flat plate of the abdomen usually reveals a ground glass appearance, a more or less opaque shadow, in one or the other flanks with a concomitant medial displacement of the bowel gas shadows. Pyelograms are useful; although rarely required for diagnosis, they are instructive; for, they not only may evalu-

ate the function and display outline of the other kidney but may aid the surgeon in mentally outlining his approach to the technical problems of its excision and hoped for extirpation.

Rarely in the realms of medicine and surgery is a condition so obvious that it requires no differential consideration, and the embryoma of the kidney is no exception. First and foremost in passing should be considered the previously mentioned *sympathetic neuroblastoma*, found in slightly greater frequency among similar age groups; it is highly malignant and metastasizes early. Although firm, with poorly defined borders, it is usually smaller and has more pebbly or finely nodular surface. Next from the point of view of frequency is the *hydronephrosis* which with its own characteristics and especially the pyelograms can readily be differentiated.

Tumors and *enlargements of liver and spleen* especially of the latter as well as *visceral tumors* must likewise be kept in mind. The *hypernephroma* so common as a tumor of the kidney in adults need hardly be considered here because of its absence in childhood. Tragic to relate, but by and large, the diagnosis is not usually a difficult problem, since by the time the physical examination of the child is sought the characteristic abdominal mass is altogether too self-evident and beyond the domain of a favorable prognosis.

All patients left untreated die; most patients even if treated die. Nevertheless irrespective of size as long as there is no evidence of metastasis elsewhere Ladd states "surgical excision holds the only hope" and should be carried out without delay, without preoperative irradiation. Most clinicians universally are not in full agreement with this dictum but prefer to procrastinate long enough to accomplish some shrinkage of the mass with preoperative irradiation. For no specific reason in the case herewith presented we chose to follow Ladd's assertion and operate without previous radiation on what proved to be a hopeless proposition in which the renal pedicle and vessels were so choked with neoplastic tissue that the clamps could be removed from the unligated stumps without the slightest semblance of even a bloody ooze.

CASE REPORT

L. T., a seven months' old white female of polish extraction, was born at the Lowell General Hospital prematurely at about seven months' gestation on February 15, 1944, weighing four pounds and twelve ounces. She gained steadily on breast milk, was brought to the Hospital religiously and conscientiously daily by the mother and was finally discharged on February 22, 1944, weighing six pounds; up to the present time she had developed normally. She was readmitted to the Children's Ward of the Lowell General Hospital on October 9, 1944, at the age of seven months with a temperature of 102.6 F., a swollen abdomen and a mass in the left side and flank which had been noted during a cursory examination. At the time the mother stated that the child had been fussy and fretful for the past week or so and of late did not want to be bathed; she had been a little feverish too but thought that it was due to teething, especially, when for the last few days she had begun to refuse her food, even the bottle. The bowels had been normal and except for wetting frequently she had noticed nothing unusual about the urine, except that when asked specifically about any change in color she believed that at times it had been "sort of rusty."

A thorough physical examination revealed negative findings in general with the exception of a most marked palor almost of a waxy nature, feverish and fretful, restlessness associated with a tearless whining cry. One middle incisor tooth had just made its appearance. The chest, heart, and lungs were normal.

The abdomen was round, full and markedly distended, more or less hard, firm, and tender throughout although not board-like; however, between respirations it appeared moderately softened especially on the right side. On the left side there still appeared to be some spasm and rigidity with a suggestive readily outlined mass in the entire left flank over which there was considerable tenderness to both superficial and deep palpation. The left flank definitely seemed to bulge and had a solid feel to it. Rectal examination was noncontributory; all reflexes

were active. On October 10th, hemoglobin was 70 per cent; red blood cells, 4,410,000; white blood cells 16,100 with a normal differential, the following day the hemoglobin was 62 per cent; red blood cells 3,920,000; white blood cells 12,300. Coagulation time was three minutes, and bleeding time two minutes. The red blood count appeared slightly achromic and polychromatic. Her blood type was Type O.

Urinalysis showed the urine to be acid; specific gravity 1:020; a slight positive trace of albumin but no red blood cells; pus cells were rare; crystals were seen; and the patch test for tuberculosis was negative. *X*-rays of the chest showed lung fields clear and heart shadow normal; but the heart pushed up by a diaphragm which was high from what suggested distention in the abdominal cavity.

On October 11, 1944, a report on an *x*-ray of the abdomen was as follows: "There is a large homogeneous area of dullness on the left side displacing the colon towards the right. The appearance suggests a large left kidney."

On October 14, 1944, the report on an intravenous pyelogram stated: "The examination was not entirely satisfactory. However, some of the opaque solution was seen in the right kidney but none in the left. One of the films showed a large fusiform shadow in the bladder region, the nature of which is hard to determine. However, this probably represents the bladder shadow, the right side perhaps not being filled. The appearance suggests a tumor of the left kidney."

While the child was under care preoperatively with transfusions and intravenous solutions, etc., she began to have edema of the limbs and abdomen. However, on the morning of the operation although the pulse and respirations were rapid, her condition did not appear too badly. So after cutting down on the ankle vein for a phlebotomy in order to give a continuous transfusion during the operation, the patient was anesthetized with ether and a left rectus incision was made, splitting the rectus muscles to grasp and open the peritoneum through which there immediately protruded several loops of distended small bowel. With the small bowel walled off, the peritoneum along the left gutter and colon was incised so that the colon could be retracted well medially from the splenic flexure to the sigmoid. Rotating the colon medially thus exposed almost in its entirety a large tumor occupying all the perirenal area and extending to the pelvic brim, being as large as a child's toy football. With some difficulty the kidney and tumor was freed anteriorly and posteriorly but it was quite obvious that there was considerable metastatic glands around the renal vessels and pedicle extending retroperitoneally over to and along the spine. With the pedicle freed, clamps were placed about the renal vein and artery and then cut between. The artery was tied successfully but in attempting to tie the vein structures which were of a cheesy consistency the tie cut through them completely; however, there was absolutely no bleeding because the vein appeared to be choked with metastatic malignant tissue. The ureter was exposed, cut and tied. The colon was resutured back into its gutter and the abdomen closed in layers in the usual fashion.

As the child was being lifted from the conveyor back to her bed she suddenly turned very cyanotic, coughed and choked a few times, gasped and expired before oxygen or anything else could be administered. No autopsy was obtained but it would appear very likely with our operative findings that some of that mass choked in the renal vein became dislodged and floated to the lungs as a massive metastatic pulmonary embolus.

SUMMARY

To summarize this subject of embryoma of the kidney which unfortunately carries such a poor prognosis, one usually has to deal with a somewhat pale, fretful, young child running a silent, painless, symptomless course finally coming for a check-up, or because of an accidently discovered abdominal mass whose surface is smooth but nodular and extending one-half to two-thirds down one or other of the flanks. The differential diagnosis is briefly considered and the treatment of preoperative irradiation followed by surgical excision discussed.

An almost classical text book type of case is reported; however, the usually fatal outcome came a little more abruptly than was anticipated and was thought, because of the operative finding, to be due to massive metastatic pulmonary embolus. The treatment with no evidence of metastasis

is nephrectomy with or without preoperative irradiation, the latter still somewhat of a moot point

Embryoma of the kidney carries a grave prognosis, death within a few years at best.

REFERENCES

1. Apfel, Harry and Goldfader, Philip. Wilm's tumor. Report of a case in a boy six and one half years old with an interesting clinical course. *Arch. Pediat.*, 60: 589, 1943.
2. Campbell, M. F. Primary malignant tumors of the urogenital tract on infants and children. *J. A. M. A.*, 109: 1606, 1937.
3. Daw, W. J. Wilm's tumor. *Pennsylvania M. J.*, 46: 1293, 1943.
4. Dean, A. L., Jr. and Pack, G. T. Embryonal adenosarcoma of the kidney, *J. A. M. A.*, 98: 10, 1932.
5. Kerr, H. D. Treatment of malignant tumors of the kidney on children. *J. A. M. A.*, 112: 408, 1939.
6. Kretschmer, H. L. Malignant tumors of kidney in children. *J. Urol.*, 39: 250, 1938.
7. Kretschmer, H. L. Adenomyosarcoma of kidney (Wilm's tumor). *Arch. Surg.*, 41: 370, 1940.
8. Ladd, W. E. Embryoma of the kidney (Wilm's tumor). *Ann. Surg.*, 108: 885, 1938.
9. Ladd, W. E. and White, R. R. Embryoma of the kidney (Wilm's tumor). *J. A. M. A.*, 117: 1858–1862, 1941.
10. Maslow, L. A. Wilm's tumor: report of three cases and a possible fourth in same family. *J. Urol.*, 43: 75, 1940.
11. Mixter, C. G. Malignant tumors of the kidney in infancy and childhood. *Ann. Surg.*, 96: 1017, 1932.
12. Morgan, J. L. Wilm's tumor: case report. *Memphis M. J.*, 18: 5, 1943.
13. Priestley, J. T. and Broders, A. C. Wilm's tumor; clinical and pathological study. *J. Urol.*, 33: 544, 1935.
14. Priestley, J. T. and Schulte, T. L. The treatment of Wilm's tumor. *J. Urol.*, 47: 7, 1942.

The *indications* for nephrectomy are severe kidney trauma, tuberculosis, tumors, extensive chronic or acute infection with destruction of the kidney, large calculi which cannot be removed successfully without removal of the kidney, certain cases of ectopic kidney, and selected cases of hydronephrosis.

From "Operations of General Surgery" by Thomas G. Orr (W. B. Saunders Company).

DOUBLE GALLBLADDER*

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CONGENITAL anomalies of the gallbladder are uncommon. Boyden[1] found only two examples of double gallbladder in the reports of anatomical dissections of 9,221 cadavers collected from eleven American anatomical laboratories.

In a review of the literature only forty cases were found representing congenital reduplication of the gallbladder proven by autopsy or operation. Twenty-three of these cases occurred in females and eight in males. In nine cases the sex was not stated. Cases that were inadequately described, those discovered during *x*-ray examinations, and deformities which were obviously inflammatory in origin were purposely omitted from this study.

As a result of his study Boyden[1] classified this anomaly into two groups: The first, vesica divisa, or cleft gallbladder, is the result of division of the primary cystic diverticulum forming a partial reduplication of the organ with two cavities emptying into a common cystic duct. Externally these may appear with a cleft or a single fundus. In the latter, sagittal section of the vesicle reveals a longitudinal septum dividing the organ into two chambers. There were five reported cases of cleft gallbladder[2–5] to which is added the example described in this report.

The second group, vesica duplex, is composed of those with two gallbladders and two cystic ducts. The accessory gallbladder arises from either the cystic, hepatic, or common bile duct. There were twenty-four examples of this group in the literature. These can be further subdivided into the Y-shaped type and the ductular type. In the former, the two gallbladders are usually bound together and occupy the same fossa of the liver. The two cystic ducts unite to form a common cystic duct which empties into the common bile duct. Eight of the cases were of this type.[7–14]

In the ductular type the cystic ducts empty separately into the common bile duct with the two organs attached to the same or different lobes of the liver. Sixteen cases of this type were reported in the literature.[4,15–29]

There was insufficient description in eleven of the reported cases to place them in either of the above mentioned groups.[30–39]

CASE REPORT

D. L., C.H.H. No. 20361, a forty-two year old, white housewife, complaining of severe epigastric pain of twelve hours' duration, was admitted on August 29, 1941, to the Surgical Service of the Church Home and Hospital. The pain was constant and accompanied by nausea, vomiting and diarrhea.

The patient was an acutely ill, obese female with an admission temperature, pulse and respiratory rate of 98.6°F., 70, and 22, respectively. There were tenderness, rigidity, and rebound tenderness in the epigastrium and region of the gallbladder.

The white blood cell count was 11,700. There was a trace of albumin in the urine. *X*-ray examination of the gallbladder on September 2, 1941, following the oral administration of tetraiodophthalein showed that the gallbladder failed to concentrate the dye to normal intensity.

On September 5, 1941, the patient was operated upon under nitrous oxide-oxygen-ether anesthesia. An upper right rectus incision was made and the gallbladder located without difficulty. It was surrounded by adhesions which

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were readily separated. Lying beneath it was a cystic mass likewise covered by adhesions. Upon dissection of this mass another vesicle was exposed. The fundi were connected by a fibrous tissue band and there were a common ampulla and cystic duct. Both fundi with the ampulla and a portion of the cystic duct were removed.

The postoperative course was uneventful and uncomplicated and the patient was discharged from the hospital on the eighteenth postoperative day.

On pathological examination the gallbladder presented the unusual appearance of two distinct lobes, the larger measuring 7 by 2 cm. and the smaller 5 by 2 cm. These lobes united to form a common cystic duct of which a portion 8 mm. in length was present. (Fig. 1.) The external surfaces were rough and shaggy and the tissues congested and edematous. On opening the vesicles the mucosa was found to be well preserved in the larger lobe but was degenerated and eroded in the smaller one. Impacted in the base of the smaller lobe was an oval, "mulberry-type" gallstone measuring 12 by 15 mm. which was distinctly separated from the lumen of the larger lobe by a well developed septum. A similar, slightly larger stone and four smaller stones were found free in the fundus of this smaller lobe. Numerous similar stones ranging up to 12 mm. in diameter were found in the larger lobe.

Microscopic section of the fundi showed moderate edema and diffuse polymorphonuclear and lymphocytic cellular infiltration. There was a definite muscular layer in each lobe, the muscularis of the smaller lobe being thicker and more fibrotic. The mucosa of the larger lobe was relatively well preserved but in the smaller one there was considerable erosion with scattered areas of superficial necrosis and leucocytic infiltration. Sections showed the muscular walls of the two organs to be distinctly separated by loose fibrous tissue.

CONCLUSIONS

1. Congenital reduplication of the gallbladder is uncommon.

2. A review of the literature revealed forty cases of this anomaly.

3. The existing types of double gallbladder can be explained on an embryological basis.

4. A case of vesica divisa or bilobed gallbladder is described.

The author is indebted to Dr. Vernon Norwood for the pathological study and report of this specimen.

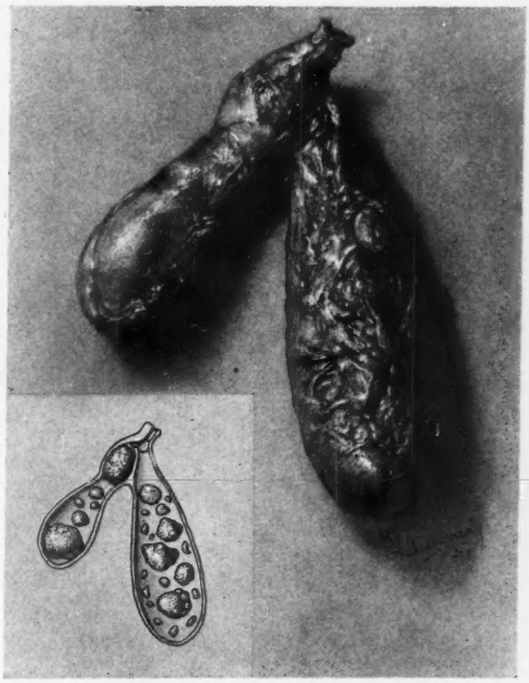

FIG. 1. Artist's drawing illustrating the bilobed gallbladder with small portion of the cystic duct attached. Insert shows the arrangement of the calculi within the vesicles.

REFERENCES

1. BOYDEN, E. A. The accessory gall bladder: an embryological and comparative study of aberrant biliary vesicles occurring in man and the domestic animals. *Am. J. Anat.*, 38: 177, 1929.
2. PHILLIPS, E. W. M., ISAAC, D. and MACDONALD, J. Four biliary anomalies: a plea for cholecystgastrostomy. *Brit. M. J.*, 1: 665, 1931.
3. HILT, L. M. Bilobed gall bladder. *Radiology*, 28: 233, 1937.
4. WEISS, S. Diseases of the Liver, Gall Bladder, Ducts and Pancreas: Their Diagnosis and Treatment. New York, 1935. Paul B. Hoeber, Inc.
5. RYCROFT, B. W. A case of bilocular gall bladder. *Brit. J. Surg.*, 10: 579, 1923.
6. MEYER, A. W. Doppelte Gallenblase. *Deutsche Ztschr. f. Chir.*, 211: 404, 1928.
7. HUBER, J. J. Cited by Boyden.[1]
8. SCHULZ, J. Ein Beitrag zur Gallensteinchirurgie. *Beitr. z. klin. Chir.*, 92: 359, 1914.
9. HARDESTY. Cited by Boyden.[1]
10. ERDMANN. Cited by Boyden.[1]
11. MININ, N. I. Cited by Stolkind.[41]
12. SLAUGHTER, F. G. and TROUT, H. H. Duplication of the gall bladder. *Am. J. Surg.*, 19: 124, 1933.
13. WAKELEY, C. P. G. A double gall bladder removed by operation. *Brit. J. Surg.*, 15: 334, 1927.

14. Stohr, R. Zur Pathologie der doppelten Gallenblase. *Zentralbl. f. Chir.*, 61: 2202, 1934.
15. Blasius, G. Cited by Boyden.[1]
16. Witty. Cited by Purser.[17]
17. Purser, J. M. Liver with two gall bladders. *Brit. M. J.*, 2: 1102, 1886.
18. Lambert. Cited by Boyden.[1]
19. Wischnewsky, A. W. Doppelgallenblase, wahrend der Operation aufgedeckt. *Arch. f. klin. Chir.*, 135: 779, 1925.
20. Braun, A. Doppelbildung der Gallenblase. *Zentralbl. f. Chir.*, 53: 1055, 1926.
21. Priesel, A. Verdoppelung der Gallenblase beim Menschen. *Virchows Arch. f. path. Anat.*, 265: 76, 1927.
22. Wolfson, W. L. Supernumerary gall bladder. *Am. J. Surg.*, 6: 88, 1929.
23. Petrina, E. Cited by Gross.[28]
24. Croudace, W. H. H. A case of double gall bladder. *Brit. M. J.*, 1: 707, 1931.
25. Strukow, A. J. Zwei Gallenblasen beim Menschen. *Centralbl. f. allg. Path. u. path. Anat.*, 50: 420, 1931.
26. Kennon, R. A double gall bladder opening by two cystic ducts into the common bile duct. *Brit. J. Surg.*, 20: 522, 1933.
27. Herrmann, S. F., Hicks, G. S. and Martin, D. L. Double gall bladder: report of a case. *Arch. Surg.*, 27: 905, 1933.
28. Gross, R. E. Congenital anomalies of the gall bladder: a review of one hundred and forty-eight cases, with report of a double gall bladder. *Arch. Surg.*, 32: 131, 1936.
29. Wilson, C. C. Double gall bladder with two cystic ducts and two cystic arteries. *Ann. Surg.*, 110: 60, 1939.
30. Millbourn, E. Über die doppelte Gallenblase, im Anschluss an zwei beobachtete Falle. *Acta chir. Scandinav.*, 84: 97, 1941.
31. Sherren, J. A double gall bladder removed by operation. *Ann. Surg.*, 54: 204, 1911.
32. Schachner, A. Anomalies of the gall bladder and bile passages. *Ann. Surg.*, 64: 419, 1916.
33. von Haberer, H. Ueber Doppelung der Gallenblase. *Arch. f. klin. Chir.*, 126: 25, 1923.
34. Nichols, B. H. Double gall bladder. *Radiology*, 6: 255, 1926.
35. Garofalo, F. Cited by Gross.[28]
36. Holdermann, H. H. Double gall bladder. *Ann. Surg.*, 91: 475, 1930.
37. Gohl, J. D. Cited by Boyden.[1]
38. Hamann. Cited by Boyden.[1]
39. Porter, L. Diseases of the Liver, in Abt, I. A. Pediatrics by Various Authors. Vol. 3, p. 677. Philadelphia, 1924. W. B. Saunders Company.
40. Arey, L. B. Developmental Anatomy. P. 206. Philadelphia, 1937. W. B. Saunders Company.
41. Stolkind, E. Double gall bladder: report of a case and review of 38 cases. *Brit. J. Surg.*, 27: 760, 1939.

DUODENAL OBSTRUCTION COMPLICATING CHOLECYSTECTOMY

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THIS case from the Carson C. Peck Memorial Hospital, Brooklyn, is interesting from several view points which separately and collectively constitute departures from the usual: (1) The gallbladder was of distinctly hour-glass formation. (2) The postoperative course was marked by vomiting which persisted for fifty days; and (3) there was an abnormality of the duodenum, with enteritis of the duodenojejunal junction.

CASE REPORT

Cholecystectomy was performed six and one-half years before. The patient was an eighteen-year old female who for most of her life had intermittent attacks of vomiting lasting ten days or less.

Six months before operation she had an attack of excruciating right upper quadrant pain with vomiting and jaundice. Her past history revealed vomiting in the neonatal period, which was investigated by *x*-ray for hypertrophic pyloric stenosis. This condition, however, was not present. At the age of fourteen she had an adenoma of the thyroid removed following which she had no vomiting attacks for about one year. Physical examination six and one-half years before revealed a well nourished, well developed girl without abnormal physical findings. The gallbladder study by *x*-ray showed that the gallbladder did not fill and that there were no opaque calculi.

In early February, 1939, a cholecystectomy was performed under ether and cyclopropane anesthesia. There were no calculi palpated in the gallbladder or the biliary ducts. The gallbladder was normal except for its hour-glass formation.

The postoperative course was remarkable mostly because of continued vomiting. There was moderate upper abdominal distention, but the abdomen below the umbilicus was scaphoid and remained so. The bowels moved first on the fourth postoperative day and continued to move throughout her prolonged hospital stay.

In the first twenty-three days after cholecystectomy, her temperature rose to 103°F. on two occasions. More often it was less than 100°F., at times going to 101°F. Her pulse was never over 120. Most of the time it was between 70 and 100. She continued to vomit. She had upper abdominal cramps. During this twenty-three-day period, the end of which was marked by a second laparotomy, she received many small transfusions to sustain her, plus infusions of Hartman's and Ringer's solution to supply the needed salts and fluids.

On the fourth day after cholecystectomy a Levine tube was passed into the stomach. This was done because the vomiting, which occurred two or three times each day, had not responded to infusions of glucose and saline or to the removal of the cigarette drain from Morrison's pouch and because there was some soft, upper abdominal distention. Through the Levine tube 1,000 cc. of dark, brown liquid was aspirated and following this, for a time, amounts such as 600 cc. were drawn through the tube. The tube was kept in the stomach because the dark brown fluid would repeatedly collect. Presently the returns became bile-stained, clearer and less putrid. After the stomach contents had assumed this improved character, the tube was clamped off for several hours at a time, but it was found that the stomach would repeatedly fill. The bowels continued to move, though in small amounts.

During this period aspirations of the stomach were effected by the use of Wangensteen suction. The stomach contents consisted of biliary and gastric juices, plus thin foods which the patient was allowed to take by mouth. These contents were sucked into a catch bottle and introduced into the rectum through a Harris drip.

On the twelfth postoperative day, a Miller-Abbott tube was substituted for the Levine tube.

FIG. 1. Balloon beyond pyloric sphincter.

FIG. 2. Barium in the stomach, some in duodenum and some in misplaced upper jejunum.

FIG. 3. Balloon seen in transverse duodenum one inch to right of midline.

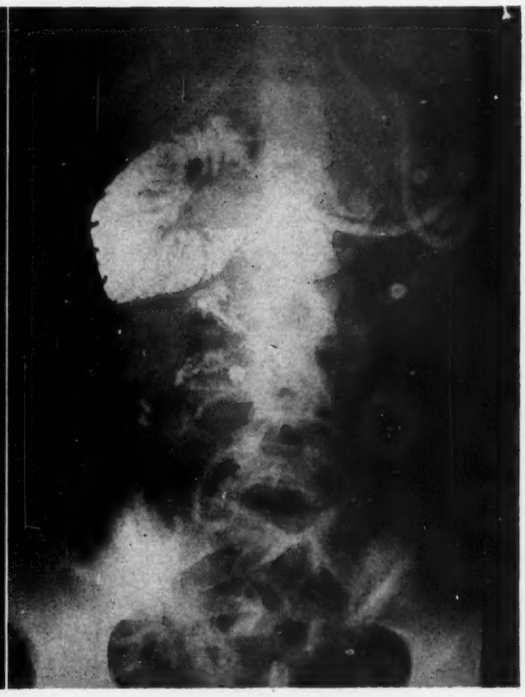

FIG. 4. Great distention of first and second portions of duodenum with thin column of barium in the distal part of third portion terminating at the right of the spine.

X-ray studies were as follows: The first plate showed the tip of the tube in the stomach with some gastric dilatation, mostly due to gas. The following day a thin barium mixture was injected into the balloon and the location of it was found to be just beyond the pyloric sphincter. (Fig. 1.) The next day a barium solution was run down the open side of the Miller-Abbott tube. (Fig. 2.) *X*-ray showed some barium in the stomach, some about the tip of the tube in the duodenum, and some in the upper jejunum. The jejunum was seen to lie to the right instead of to the left of the spine. The next picture was taken twenty-four hours later; the balloon was seen in the transverse duodenum about one inch to the right of the mid-line. (Fig. 3.) A later *x*-ray study with more barium showed a great distention of the first and second portions of the duodenum with a thin zigzag column of barium in the distal part of the third portion, (Fig. 4) coursing downward to the right of the spine. These pictures led to the conclusion that a partial obstruction existed at the termination of the third portion of the duodenum, also that it was probably chronic as evidenced by the tremendous distention and elongation of the proximal duodenum. (Figs. 5, 6 and 7.)

Clinically, she was becoming progressively worse. There was a steady advance in emaciation and the advent of irregular twitchings of hands, feet and face, which were interpreted as tetanic. These were treated with calcium gluconate and she responded well.

Another complication was bleeding from the stomach, which may have been due to extended intubation. This complication was met with the administration of amphogel and the bleeding stopped.

Having established that the obstruction was not complete, a so-called duodenal or predigested feeding was given through the tube for the benefit which might accrue from that portion which passed the obstruction. In the presence of her semi-starvation, attention was paid to vitamin therapy, especially administration of B_1. If the stomach was not emptied at regular intervals, the patient would vomit unfailingly.

Therefore, on the twenty-fourth day postoperatively, a laparotomy was performed with the intention of relieving the obstruction or performing a duodenojejunostomy. A right-sided, paramedian, upper abdominal incision was made. Extensive adhesions were found between the stomach and transverse colon to the anterior abdominal wall. These were

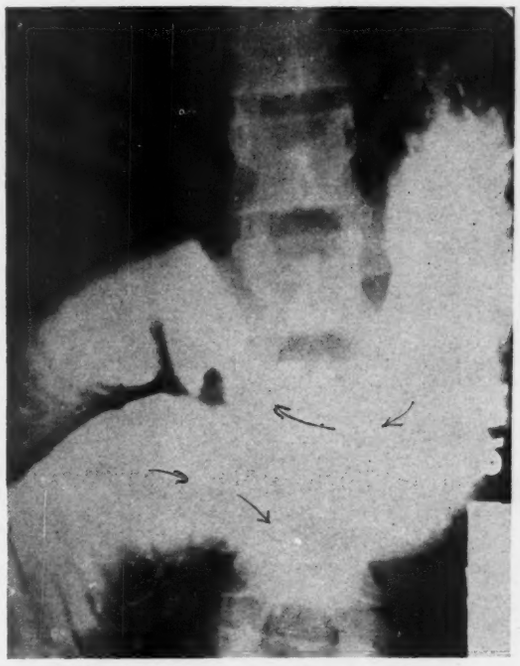

FIG. 5. Dilated stomach and distended duodenum.

separated at the expense of considerable time. Ultimately the viscera were freed sufficiently to evaluate the pathological condition at the distal duodenum. The proximal duodenum was found to be greatly distended, its wall so thin as to make apparent the Miller-Abbott tube still *in situ*. This portion of the duodenum was supplied with a mesentery long enough to allow it to be brought up to the level of the anterior abdominal wall. The duodenum was followed downward in the abdomen where it was fastened at a point to the right of the spine for a distance of two inches. It presented the following condition: It was indurated and fixed; there was loss of serosal luster; the serosa was injected and speckled with minute reddish, punctate areas; there was no exudate; the jejunum beyond was normal and collapsed; the superior mesenteric artery did not pass anterior to the duodenum.

By this time the patient was in exceedingly poor condition and further surgery was abandoned. The abdomen was closed with through and through sutures.

Her reaction was stormy for two days, following which she quieted down. Renewed efforts were made to sustain her with transfusions, parenteral fluids and salts. Gradually

her gastric retention became less and less. She gained strength slowly and was fed by mouth with the tube in the stomach as a safety valve. On the fourteenth day after the second operation, retention was small enough to warrant removal of the Abbott tube.

During the remainder of her stay in the hospital she vomited from time to time and had repeated epigastric cramps. Her vital balance was now on the positive side. Slowly she gained weight and strength until on the fifty-seventh day in the hospital she was in satisfactory condition for discharge.

In the eleven months following the operation the patient gained forty-eight pounds and vomited once. Now approximately six and one-half years have elapsed since her discharge from the hospital. She quickly became strong and robust and has remained so.

FIG. 6. Barium shown in duodenum terminating to right of spine; beginning jejunum lying completely to the right of spine.

FIG. 7. Barium in stomach, and dilated duodenum; jejunum lies to right of spine.

CONCLUSIONS

1. The patient presents two congenital defects, first, the abnormal hour-glass gallbladder; secondly, the fault in the fixation of the duodenojejunal junction.

2. The duodenal fault has in no way been remedied.

3. The practice of doing a gastrointestinal *x*-ray in all conditions suggestive of gallbladder disease would in this case have been valuable.

OSTEOCHONDROMATOSIS OF THE ELBOW

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OSTEOCHONDROMATOSIS is a disorder of joints, bursae or tendon sheaths, characterised by formation of osteocartilaginous bodies arising, evidently, from synovial membranes. It appears to be a rare condition, as Böhm[1] and Bunne[2] mentioned only eighty cases reported in the literature. Of these, twenty-seven cases were found to occur in the knee joint and thirty-six cases in the elbow. Bursae were involved in two instances and tendon sheaths in three. Only three cases, all in the knee joint, were bilateral.

The etiology is obscure. The principal factors which are considered as causes are infection, trauma, embryologic maldevelopment and neoplasia. Although infection may be excluded with reasonable certainty, there is considerable difference of opinion, from the discussions of Böhm[1] and Rixford[3] regarding the relative importance of the remaining factors.

From the standpoint of pathogenesis it is generally accepted that the osteocartilaginous bodies, varying greatly in size, number and location, are derived from synovial tissues and may exist for indefinite periods of time within the joint space, either in attachment to the synovium or as free bodies. It is also agreed that varying degrees of synovitis may develop in connection with the formation of these structures.

The clinical features, subjective and objective, depend on the number, size and location of the osteocartilaginous formations. According to Wilmoth,[4] who reported nine cases, the general subjective symptoms are those usually complained of in arthritic joints. Among objective manifestations, palpation of the loose bodies within the joint cavity is the most important finding and the diagnosis is confirmed by roentgenographic study, by which an accurate appraisal of the extent of involvement is made possible.

Treatment consists of surgical removal of the osteocartilaginous structures and in addition it is in some cases necessary to undertake a partial synovectomy.

The prognosis, in general, is favorable with regard to restoration of function and recurrence is rarely, if ever, noted.

CASE REPORT

The patient was a white male, aged thirty-three, employed as a burner in a shipyard, and complaining of pain and loss of motion in his right elbow. Three days previously he slipped and fell on a steel plate, breaking the fall with his outstretched right hand. He noted no immediate ill effects except a mild discomfort in his right elbow. Two days after the fall, while reaching forward for an instrument, he felt a sudden sharp pain in the right elbow and found that motion in the joint was restricted due to pain. The pain became gradually more intense, being most pronounced over the outer aspect of the joint and radiating upward to the shoulder.

Examination of the elbow showed no obvious deformity or inflammation. Active motion was possible from 80 to 150 degrees. Beyond these ranges, motion caused pain on the lateral aspect of the joint. Pronation and supination of the forearm were approximately normal in range and painless. Posterolaterally over the elbow a swelling was noted, about one inch in diameter, somewhat irregular, slightly movable, firm, and tender on pressure or manipulation. No effusion was found in the joint. Mild tenderness was present also over the anterior and medial surfaces of the elbow.

Roentgenographic examination (Fig. 1) showed several small shadows within the joint space and situated between the upper end of the ulna and the head of the radius. Diagnosis: Osteochondromatosis.

Operation, undertaken six days after onset of symptoms, consisted of a posterolateral incision, splitting of the anconeus muscle, opening of the capsule and removal of three bony structures from the joint cavity. These bodies were attached to each other by fine strands of soft tissue, but were not attached to any portion of the capsule. About 15 cc. of straw-colored fluid escaped from the joint space. The synovial membrane, visible over a small area appeared normal. The wound was sutured in layers.

A B

FIG. 1. A, lateral and B, oblique views of elbow showing osteocartilaginous bodies situated between head of radius and upper end of ulna.

Pathologist's report: "Macroscopic: Three small pieces of bony tissue which are attached to each other by thin bands suggesting synovial membrane. The bony structures measure 13 × 12 × 8 to 17 millimeters in extent. On section they consist of friable calcareous tissue. The outer surface is somewhat irregular and for the most part covered by the membranous tissue which forms the connection between the fragments.

"Microscopic section of one of the small pieces of bony tissue shows a structure composed of various stages in the development of cartilage and bone. There are also foci of amorphous calcareous material, suggesting calcified cartilage. Some portions of the periphery show a highly cellular tissue but synovial membrane was not found.

"Diagnosis: Articular Osteochondromatosis."

Postoperatively a sling was used for support. The incision healed by primary union. Ten days after operation, a painful swelling with fluctuation appeared at the operative site. This was interpreted as a localized synovitis, for which roentgen therapy was administered on two different occasions. Postoperative roentgenograms showed no abnormality. The pain and swelling subsided, motion in the joint increased in range, and the man returned to light work twenty-four days after the operation. Eight weeks after operation he was performing his regular work. He stated that he had no pain in the elbow and that he "can do practically anything with it." The range of active motion at

this time was from 50 to 170 degrees. When he was seen five months after operation his only complaints were incomplete extension of the elbow and pain in the elbow when throwing a baseball. Active motion was present from 50 to 170 degrees. Pronation and supination of the forearm were normal in range and painless.

COMMENT

This case appears to be somewhat atypical from the standpoint of its acute onset, without previous indication of disability. The osteocartilaginous bodies undoubtedly had their origin for an indefinite period of time before manifestations appeared. The location from which these formations arose within the joint is also a matter of speculation, although it is likely that there had been very little shifting within the articular space.

SUMMARY

A case of osteochondromatosis of the elbow is reported with clinical, operative and pathologic findings. Postoperative observation over a period of five months showed practically complete return of function, the principal feature of disability being a 10-degree restriction of extension of the elbow.

REFERENCES

1. Böhm, F. Synoviale osteochondromatosis und Trauma. *Deutsche Ztschr. f. Chir.*, 212: 275–284, 1928:
2. Bunne, F. Zur Kenntniss der synovialen Osteochondromatose. *Deutsche med. Wchnschr.*, 55: 1130, 1929.
3. Rixford, E. Osteochondromatosis. *Ann. Surg.*, 92: 673, 1930.
4. Wilmoth, C. L. Osteochondromatosis. *J. Bone & Joint Surg.*, 23: 367, 1941.

TAENIA SAGINATA IN THE APPENDIX

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THIS case of taenia saginata in the appendix is reported because it is a medical curiosity. Many cases of foreign bodies in the appendix have been reported in the literature. Fowler, in a review of 10,095 cases of appendicitis, reported an incidence of 2.6 per cent due to foreign bodies. These cases contained calcified fecaliths, seeds, grain, pins, toothpicks, gunshot, fish bones, pin worms, but no cases of taenia were reported.

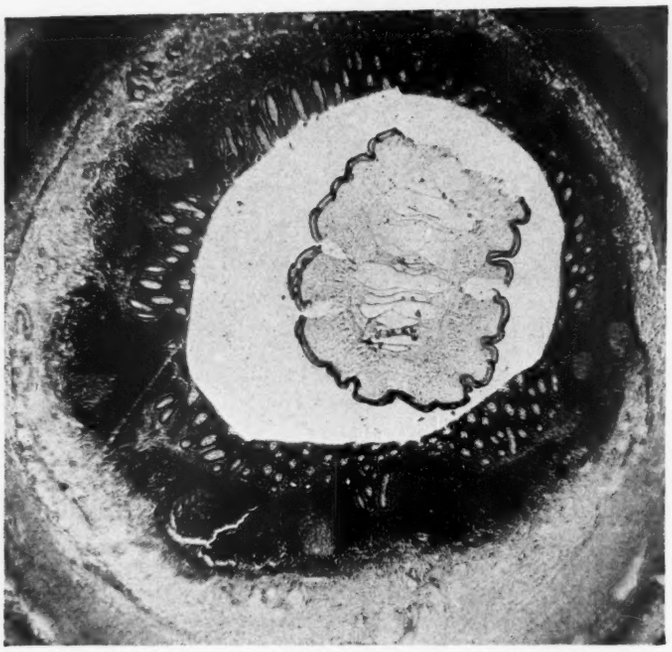

FIG. 1. Tapeworm in lumen. Note ova in the segment of the worm. Each proglottis has its own ovaries, uterus and testicles.

CASE REPORT

On June 16, 1944, Mrs. A. T., a white woman, age twenty-three, complained of a dragging discomfort in the lower right quadrant. She gave a history of recurrent attacks of pain that lasted several hours but she did not get excited about her condition because the pain was not severe. However, lately the symptoms were becoming more severe causing her to consult a physician.

The past history was essentially negative except for two pregnancies. Physical examination was essentially negative. Heart and lungs were normal. The abdomen was soft and there was no tenderness. The pelvic examination was negative. Urinalysis was negative. The red blood count was 3,800,000, white blood count 8,200, and her hemoglobin 82 per cent. A differential was not made but looking back on the case, an eosinophilia would have been a diagnostic point.

After several weeks the symptoms became more severe and a diagnosis of chronic obstructive appendicitis was made July 31, 1944. An appendectomy was performed through a right rectus incision. The appendix was edematous but rather disappointing in that it looked quite normal. When the pathological section came back, much to our surprise, the lumen of the appendix contained a tapeworm. The patient made a rapid recovery and on the sixth postoperative day was given male fern treatment

and passed a tapeworm (taenia saginata) twelve feet in length.

The patient made an uneventful recovery and is symptom free.

REFERENCES

1. Curreri, A. B. and Melick, D. W. Foreign body in the appendix. *Wisconsin M. J.*, 40: 192–193, 1941.
2. Earl, John R. B B shot in the vermiform appendix. *J. A. M. A.*, 114: 1864, 1940.
3. Foster, Miles E. and Bowers, Warner F. Obstructive appendicitis caused by a sprouting seed. *Arch. Path.*, 35: 598–600, 1943.
4. Fraser, John. Shot in the vermiform appendix. *Lancet*, pp. 1129–1130, 1928.
5. Greene, Earle I. and Greene, J. Appendiceal oxyuriasis. *Am. J. Surg.*, 48: 440–443, 1940.
6. Horton, Bayard T. Bird shot in vermiform appendix. A cause of chronic appendicitis. *Surg. Clin. North America*, 13: 1005–1006, 1933.
7. Lazarus, Joseph A. and Friedland, Henry. Perforated appendicitis due to foreign bodies. *J. Internat. Coll. Surg.*, August, 1941.
8. McCallig, John J. Appendicular obstruction: its clinical and pathological aspects. *Surg., Gynec. & Obst.*, 73: 539–544, 1941.
9. McCallig, John J. and Stalker, L. K. Appendicular obstruction. *Proc. Staff Meet., Mayo Clin.*, 15: 581–585, 1940.

An unnecessary appendectomy should not be done during an abdominal or pelvic operation which probably will be followed by some oozing of blood into the peritoneal cavity. A sump drain is routinely advisable if there is a possibility of postoperative oozing both to indicate the presence and amount of oozing and to keep the cavity free from blood and exudate.

From "Principles and Practice of Surgery" by W. Wayne Babcock (Lea & Febiger).

PARASITIC FIBROIDS*

GIANT PARASITIC FIBROID WITH SARCOMATOUS DEGENERATION

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UTERINE fibromyoma constitute the most common pathological condition seen on the gynecological wards at Charity Hospital, about 750 operations being done for this condition here each year. Despite the high incidence of these tumors, complications are extremely rare, and over 95 per cent of these patients present themselves because of the palpable tumor or because of vaginal bleeding. Most complications are due to lack of blood supply and are in order: (1) edema, (2) necrosis with liquifaction, (3) mucoid degeneration, (4) calcification, (5) hyaline degeneration, and (6) red degeneration. Malignant degeneration occurs in less than one per cent of the cases and is usually picked up accidently at pathological examination of the surgical specimen.

McFarland[1] gives a table with twenty-seven authors with statistics varying from 0.0 to 10 per cent, and quotes Albrecht as stating that there were 1.41 per cent malignant leiomyomas out of 77,076 fibroid specimens. Carl found an incidence of 0.22 per cent of 1,777 surgical cases at Memphis General Hospital. Complete cystic degeneration of a fibroid is very uncommon and only very few reports are in the recent literature. Most of the reports are in the early literature. Probably the rarity of the condition at the present time is due to the fact that in recent years diagnoses are made sufficiently early to prevent the development of huge cysts.

Wandering or parasitic fibroids are tumors which have separated from the uterus. They usually derive their blood supply from the omentum and are buried deeply in the pelvis. They occur much more frequently than is usually suspected because so few of the cases seen are reported. Four parasitic fibroids have been removed from the pelvis in the last year at Charity Hospital during hysterectomy.

The following case report represents a complication of a uterine leiomyoma that has not been previously reported in medical literature:

CASE REPORT

E. M., a fifty-one year old colored female, was admitted to Charity Hospital for the first time June 21, 1944, with the chief complaint of a lump in the left side of her abdomen. For several years she had experienced an annoying but not severe pain in the lower left thorax, but which became severe especially with deep breathing eight weeks before admission. The pain would radiate to the left shoulder. Her condition was diagnosed and treated as malaria by a private physician. Two weeks before admission she noticed a mass in the left upper quadrant just under the ribs which was getting larger. There were no chills or fever; she had a weight loss of ten pounds. The positive points in the past history and the review of systems were: (1) Several bad teeth; (2) high blood pressure for over two years (190 or higher) and she took what might have been digitallis for about one year. She stopped this drug three weeks before admission and one week before admission she developed swelling of her feet and ankles. (3) Her appetite had been poor for two months and there had been bloating after meals. (4) She was operated upon in 1939 for fibroids and had not menstruated since that time. (5) She was given arm and hip "shots" in 1940. (6) There was a positive family history of both fibroids and hypertension.

Physical examination showed a moderate hypertension (176/114) and a temperature of 99.8°F. The head and neck examination were

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essentially normal except for prominent venous pulsations on the right side of the neck. There were bilateral soft nodes in both axillae and an isolated node in the left supraclavicular fossa. other laboratory findings were normal including the blood serology and pylograms.

I first saw this patient July 4, 1944, and at that time there was a firm smooth mass in the

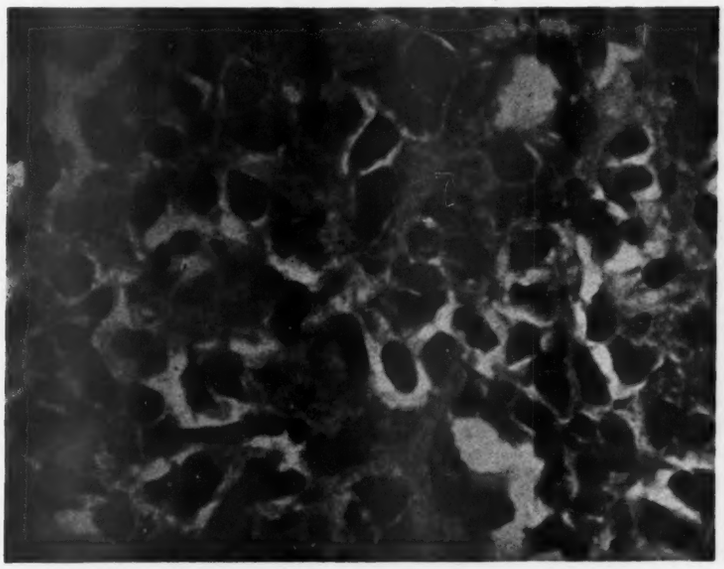

Fig. 1. Microphotograph showing numerous mitotic figures and bizarre anaplastic cells with considerable avascular necrosis due to the rapidity of growth and the parasitic blood supply limitations. × 660.

Examination of the thorax was essentially normal. The abdomen showed a midline healed scar from the umbilicus to the pubus. There was a visible mass in the epigastrium which was firm, movable and not expansile. The mass extended from the left costal margin to the midline and there seemed to be a second mass behind the first one at the costal margin. The liver was just palpable. Extremities showed no abnormalities except tenderness to motion of the right knee joint. She was sent to the medical wards with a diagnosis of abdominal tumor, essential hypertension and arthritis of the right knee. The positive laboratory findings were an anemia of 8.6 Gm. hemoglobin with 2.9 million red cells. The phenolsulfaphthalien test showed a 25 per cent total excretion. Spinal fluid serology was positive and the Lange gold curve was 5553211000. Barium enema showed a downward displacement of the transverse colon by an extrinsic mass. *X*-ray of the chest showed an elevation of the left leaf of the diaphragm. The gastrointestinal series showed displacement of the stomach and duodenum to the right but no other abnormalities. Icterus index was 8.6. Electrocardiogram showed moderated left ventricular hypertrophy. All left upper quadrant which moved readily with respiration; with deep inspiration a nodule could be felt on the mass just below the costal margin. I interpreted this as a granuloma of the spleen and asked that the patient be transfered to the surgery service. The medical staff thought that this was most likely a gumma of the spleen in view of the positive spinal fluid findings. The mass continued to enlarge despite full doses of bismuth and iodides. The patient was transfered to the surgery ward August 6, 1944, at this time the mass filled the entire abdomen and had a definite large nodule in its upper portion. There was also two plus edema of both ankles. Impressions by various members of the surgery staff included lymphoma of the spleen, retroperitoneal sacroma, and retroperitoneal cyst probably of the pancreas. My diagnosis was still an intraperitoneal mass attached to the diaphragm on the basis of the previous findings. A hematology work-up disclosed only a mild anemia and thrombocytopenia with a rapid sedimentation.

She was operated upon August 31, 1944. Under general anesthesia the abdomen was opened through a long left rectus incision. A

large cystic tumor was found filling the entire abdomen and was markedly adherent to the omentum, liver, stomach, pancreas, spleen, and diaphragm, but did not seem to arise from any one of them. The tumor was so tense and firmly fixed in the abdomen that it was thought to be much safer to aspirate its contents before mobilization of the mass was attempted; 5,000 cc. of brownish fluid was removed from the cavity of the mass. Sections of the mass were removed and sent to the pathologist for frozen section studies. The incision into the mass was then closed and mobilization of the tumor was begun. By sharp dissection it was separated from the omentum and the left lobe of the liver. The portion of the stomach adherent to the mass was excised and the stomach closed by the aseptic Parker Kerr method. After separation from the spleen and pancreas the tumor was removed only with great difficulty from the diaphragm by sharp dissection. The abdomen was closed in the usual manner in layers. The frozen section report was leiomyoma.

Her postoperative course was excellent. The sutures were out and the patient was ambulatory on her eighth postoperative day and she was discharged on her tenth postoperative day. After much study with special stains and consultation with many pathologists the final pathological report was "Leiomyosarcoma." The slides of the original fibroids that were removed in 1939 were reviewed and no evidence of malignancy could be found in these sections.

Clinic follow-ups showed no recurrence of symptoms until July 25, 1945, at which time the patient again noticed pain over the left shoulder and a feeling that she had a tumor present whenever she would breath deeply. There was a palpable hard mass which could be felt with deep inspiration just below the left costal margin. It was somewhat tender. She also had edema of the ankles. All laboratory studies were normal and she was again operated upon August 10, 1945. Through a subcostal incision the entire upper abdomen was explored. A mass about 12 cm. in diameter was found which had infiltrated the entire diaphragm and was adherent to the pericardium. There was a large solitary nodule in the liver and the omentum was thoroughly infiltrated with tumor tissue. It was believed that nothing could be done for this patient and so the abdomen was closed after biopsies of the various masses had been taken. Her postoperative course was uneventful. Pathological diagnosis was again leiomyosarcoma; the cellular pattern was almost identical with the tumor removed one year before. She was discharged on the eighth postoperative day as the radiologist did not believe that deep therapy was indicated. She was last seen on December 12, 1945, at which time the mass attached to the diaphragm had grown to the size of a football.

COMMENT

The case just presented is a unique complication of a parasitic fibroid. As far as I could determine from the literature there has been no previously reported case of a parasitic fibroid which has reached this size or which showed malignant degeneration, although many very larger cystic uterine fibroids have been reported. The interesting points in the above case presentation was the proven rapid increase in size while the patient was being held under close medical observations. The fact that this patient had had a hysterectomy for uterine fibroids five years previously, shows definitely that there are still a great many elective laparotomies being performed without an adequate abdominal exploration. The sarcomatous nature of the tumor could not be determined by frozen section, but only after very careful study with special stains made on paraffin sections.

REFERENCES

1. McFarland, J. Malignant myoma. *Am. J. Cancer*, 25: 530, 1935.
2. Spivack, M. and Pilat, I. Cystic fibroid with twisted pedicle. *Am. J. Obst. & Gynec.*, 23: 77, 1932.
3. Harris, L. C. and Schmeisser, H. C. Unusual secondary changes in myoma of the uterus. *South. M. J.*, 31: 968, 1938.
4. Alcorta, R. H. Large cystic fibromyoma. *Clin. Lab.*, 23: 645, 1933.
5. Owings, S. C. Fibroid weighing 65 pounds. *Arch. Surg.*, 27: 897, 1933.
6. Webster, J. C. Report of case of fibromyoma of uterus weighing 87 pounds. *J. Obst. & Gynec. Brit. Empire*, 4: 135, 1903.
7. McIntyre and Platinoff. Quoted by Webster.[6]
8. Severnau. Quoted by Webster.[6]
9. Hunter. Quoted by Webster.[6]
10. Behrend, H. Multilocular fibromyoma weighing 133 pounds. *Am. J. Obst. & Gynec.*, 20: 699, 1930.
11. Cullen, T. S. Large cystic fibromyoma weighing 89 pounds. *J. A. M. A.*, 48: 1491, 1907.
12. Stockard, E. C. Large cystic fibromyoma weighing 135 pounds. *Med. Rec.*, 26: 177–178, 1884.

PSEUDOCYST OF THE GREATER OMENTUM

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SEVERAL varieties of primary cystic formations of the mesentery and omentum have been described. They are classified as lymphatic, dermoid, hydatid, and other more uncommon types of endothelial cysts. These are true cysts of the omentum and they are rare. The etiology is unknown with the most satisfactory explanation being that they are congenital and due to some embryological defect or malformation. Primary omental cysts are usually thin-walled and multilocular. They may attain a huge size and usually appear early in life, before the tenth year. They are rarely malignant but when so, usually take the form of a lymphangio-endothelioma. These tumors or cystic masses are doughy, poorly circumscribed, and as a result are not easily palpable early. The treatment is complete surgical excision following which, recurrence is rare. In addition to these recognized and described forms of primary omental cysts, there are also incidents which may lead to the formation of secondary or pseudocysts of the omentum. These may be classified as inflammatory, metastatic growths which undergo cystic degeneration, and foreign body inclusion.

A recent case, admitted to the Surgical Service of this General Hospital, differs from the usual varieties and is rare enough to warrant reporting, though it is a pseudo rather than a true cyst of the omentum.

CASE REPORT

The patient, a twenty-seven year old American soldier, entered our General Hospital October 15, 1944, with a large, painless, abdominal tumor. He was able to move this mass freely about his abdominal cavity. The swelling was noticed about one year before, its first manifestation being a tightness at the waist, which he thought was due to his "getting fat." Six weeks before admission he became aware that the distention was caused by a movable mass, which had been gradually increasing in size.

FIG. 1. Preoperative appearance of patient with large pseudocyst of omentum.

His past history was essentially negative except for an appendectomy ten years before which had been performed through a two-inch lateral rectus incision. Following appendectomy he remained in the hospital ten days and convalescence was uneventful, except for one episode of sudden, sharp, abdominal pain in the right lower quadrant. This occurred on the thirty-first postoperative day, after the patient had returned to work. He was readmitted to the hospital and remained under observation for twenty-four hours, at the end of which time he was free of pain and was discharged. On admission to our surgical service he had no complaints, other than the vague abdominal distress associated with the tumor.

Physical examination revealed a healthy, 145 pound, 5 feet 6 inch soldier, essentially normal, except for the abdominal swelling. This filled the hypogastrium from the symphysis to the level of the umbilicus and was visible on inspection. (Fig. 1.) It seemed about 6 inches in diameter and was definitely intraperitoneal. It was freely movable, in spite of its large size, from the hypogastrium to the epigastrium, and laterally from the left flank to the right. It was not tender and was fluctuant, though tense.

Routine laboratory tests including blood count, blood sugar level, serum amylase and urinalysis were all normal.

X-ray revealed an essentially normal chest. Gastrointestinal studies, including barium meal, showed no evidence of intrinsic lesions of the terminal ileum was displaced upward and to the right by a shadow corresponding to the mass. (Fig. 2.)

FIG. 2. *X*-ray of abdomen following barium enema showing displacement of terminal ileum by omental tumor.

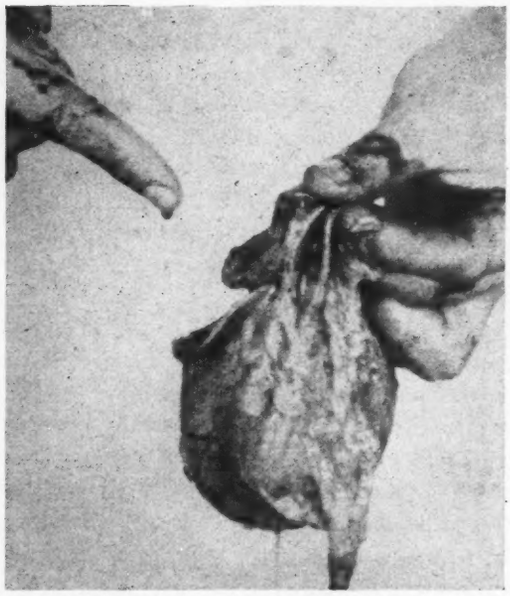

FIG. 3. Gross specimen opened with finger pointing to foreign body.

esophagus, stomach, or duodenum, nor any displacement. There was a normal distribution of barium after four hours. With a barium enema the colon was entirely normal. The

Preoperative diagnosis was omental or mesenteric cyst.

Operation on October 19, 1944, revealed the cystic mass to be attached to the distal portion of the omentum on the right side. There were no adhesions to bowel or peritoneal surfaces. The cystic mass was removed *in toto* with a pedicle of normal omentum. (Fig. 3.) Exploration revealed no adhesions in the vicinity of the ileocecal region and the appendix was absent. The postoperative course was uneventful, the patient returned to light duty one month later.

The pathology report by Lt. Col. B. H. Neiman is as follows: Specimen consists of a cyst sac to which is attached normal omentum. The cyst measures 15 cm. in diameter. The surface is smooth and on opening, the wall is from 1 to 3 cm. in thickness. The lumen is filled with a chocolate colored material with grey flocculations. The lining is purplish brown to red in color. There is also a cotton sponge free and unattached on the inside of the cyst cavity. This foreign body measures 5 by 5 by 2 cm. and resembles a folded surgical sponge.

Microscopically (Figs. 4, 5 and 6), the wall of the cyst is composed of a loose, fibrous, connective tissue. In places it has undergone pink staining material are seen. These are surrounded by multinucleated giant cells of the foreign body type. The lining of the cyst is

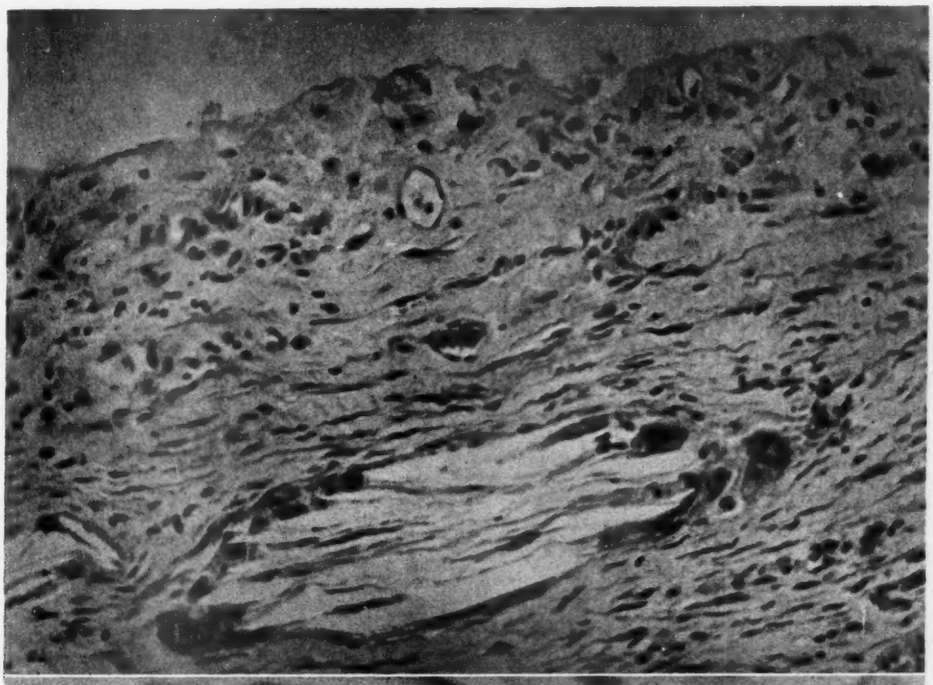

FIG. 4.

FIG. 5.

FIG. 4. Microphotograph showing the section through the wall of cyst and foreign body composed of eosin-staining thread-like structures surrounded by foreign body giant cells. Note the granulomatous lining. × 200.

FIG. 5. Microphotograph with higher magnification showing the structure of that in Figure 4. × 700.

hyalin degeneration. In its middle third, it is quit vascular and shows channels, some of which contain red blood cells. In some places, in the inner third of the wall, "threads" of smooth in many places, while in others it shows small papillary projections, comprised of granulation tissue, and diffusely infiltrated by a scanty distribution of round cells. Some larger

hystiocytic cells are also seen containing a brown pigment suggesting blood pigment.

Diagnosis: Foreign body granuloma with cystic degeneration. The foreign body is an ancient abdominal surgical sponge.

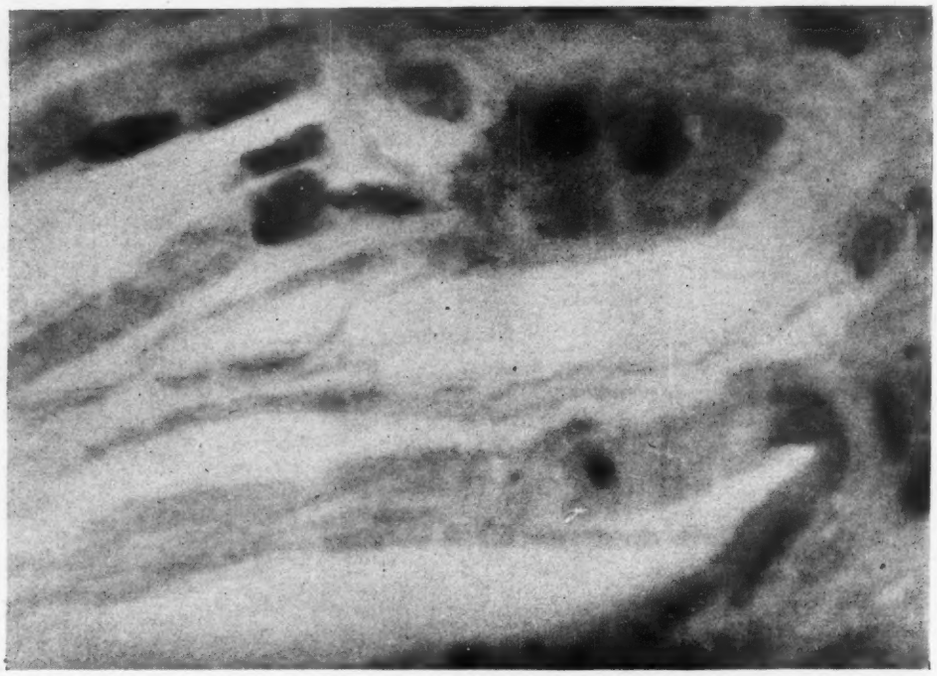

FIG. 6. Microphotograph showing the eosin-staining threads which resemble cotton from surgical sponge. × 900.

COMMENT

Although foreign bodies in the abdomen are not infrequent following surgical operations, the sequelae of such accidents are sometimes of great clinical significance and certainly the patients are not often symptom free. The course of events in this particular case can only be conjectured, as the patient was symptomless for about nine years following the appendectomy, with the exception of the history he had given on the thirty-first postoperative day. The usual course seen following intra-abdominal retention of a foreign body is its walling off by a tissue protective mechanism. We believe that such a process did take place in this case, but its interest lies in the subsequent changes following the localization. The most likely explanation is that a foreign body granuloma developed and because of a gradually decreasing blood supply regressive changes occurred with the formation of a cyst. This is suggested by the presence of the thread-like foreign bodies seen in the wall of the cyst.

CONCLUSION

An unusual case of an old retained surgical sponge within the peritoneal cavity, and the subsequent formation of a pseudocyst of the omentum, has been presented.

New Instruments

NEW SIMPLIFIED INTESTINAL DECOMPRESSION TUBE*

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WHEN Wangensteen[1] introduced his method of intestinal decompression, it was generally believed among medical men that here, at last, was a method of combatting intestinal distention. That intestinal distention, particularly the postoperative type with its associated gastric dilatation, was reduced was universally agreed upon. However, it was soon found that the tube used in the Wangensteen method did not pass down into the gastrointestinal tract as often as desired, and so often coiled up in the stomach. When this occurred, the stomach was adequately decompressed but the rest of the gastrointestinal tract could be decompressed only when the pyloric sphincter lost its tonus or if reverse peristaltsis caused the gastrointestinal contents to pass upward into the stomach.

In an effort to decompress the gastrointestinal tract adequately, Miller and Abbott[2] introduced a double lumen tube at the end of which a balloon, which could be inflated, was fastened. This balloon acted like a bolus which was then supposed to be carried down the gastrointestinal tract by peristaltsis after the bowel had been collapsed by suction. This tube was widely acclaimed by surgeons. We often found this tube to be effective, but were very soon confronted by three objectionable features:

One of the most objectionable features of the Miller-Abbott tube was the ease with which it became plugged by gastrointestinal particulate matter. This necessitated repeated irrigations and very often removal of the tube.

The second objectionable feature was the fact that very often this tube did not pass down into the gastrointestinal tract. When this occurred, the tube coiled up in the stomach and acted no better than the Levin tube. In spite of the various technics[3,4,5] proposed to expedite the passage of this tube through the pylorus, the percentage of failures was far from small.

A third objectionable feature was the fact that there were only four small holes above the balloon and several below it. If the tube passed well down into the gastrointestinal tract, the area of bowel around the distal twelve inches of tube would often be adequately decompressed, but the bowel proximal to the end of the tube would often become distended again. This was particularly prone to occur in cases in which there was an exudate in the peritoneal cavity or fluid in the intestinal tract because in these cases the patient would be actually suffering from multiple short-loop obstructions due to the kinking of the bowel creating pockets.

An examination of a cross-section of the Miller-Abbott tube reveals an interesting finding, namely, that the caliber of the lumen used for intestinal decompression is only slightly larger than the caliber of the lumen to blow up the balloon. (Fig. 1.) Since the chief function of the tube is supposed to be intestinal decompression, and the inflation of the balloon only of

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minor importance, it always seemed to us rather incongruous that their lumenal diameters should be about the same.

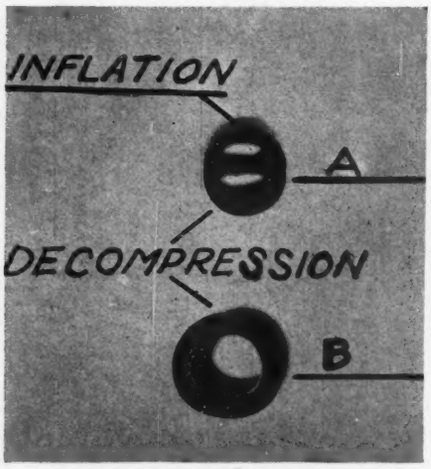

FIG. 1. Miller-Abbott tube (A). Our tube (B). Note that in the Miller-Abbott tube the lumenal diameter for suction is about the same as the lumenal diameter for inflation of the balloon. Note in contrast the large size of the lumenal diameter of our tube used for suction. Magnifications of cross-sections of tube 2 x.

This latter observation was made by Johnston,[6] who proposed a tube for decompression, attached to which was a second smaller tube used to inflate the balloon. This tube also depended upon inflation of a balloon attached to the distal end of the tube to act as a bolus and thus be carried down the gastrointestinal tract. The diameter of the lumen of the tube used for decompression is one-eighth of an inch and the lumen for the balloon one-sixteenth of an inch.

Both the Miller-Abbott and the Johnston tubes were used with varying measures of success by surgeons everywhere. Most reports were favorable, but everyone stressed the difficulty in getting the balloon to pass through the pylorus.

In 1944, Harris[7] and also Swertsen[8] working independently suggested a method by which the balloon could be carried down into the duodenum faster and with a greater degree of success than was formerly possible. They proposed to place a small amount of mercury (5 cc.) into the balloon and by shifting the patient about they were able to demonstrate that the balloon was readily carried through the pylorus into the duodenum. The balloon was then inflated and carried down the gastrointestinal tract.

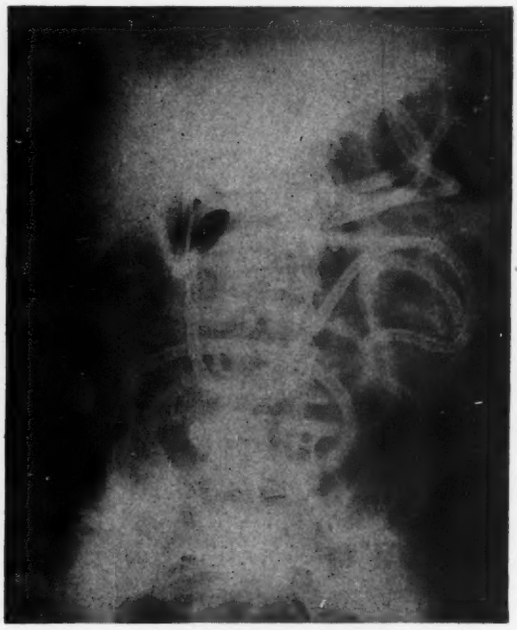

FIG. 2. Note that the tube has passed through the entire small intestine and the balloon is now seen in the ascending colon.

The use of mercury to carry a tube down into the duodenum was not new with Harris or Swertsen, however. It was the fact that they used it in the Miller-Abbott tube for intestinal decompression that was new. Wilkins,[9] in 1928, in a paper entitled, "Mercury Weighted Stomach Tube," described the use of mercury at the end of a single lumen tube to be used for gastric and duodenal lavage and feeding. Because it was used for that purpose he made his tube forty-six inches long. The compartment for the mercury was four and one-half inches long and three-sixteenths of an inch in diameter. His tube was obviously then not an intestinal decompression tube.

Since it had been demonstrated that mercury placed into the balloon would carry the tube through the pylorus in a much greater percentage of cases than formerly was the case, it appeared to us that the "raison d'etre" of the double lumen tube ceased to exist. This would be particularly the case if it could be shown that the mercury in the balloon in itself con-

stituted a bolus which could pass down the gastrointestinal tract either by peristaltic activity, by the effect of gravity, or possibly by both methods. (Fig. 2.)

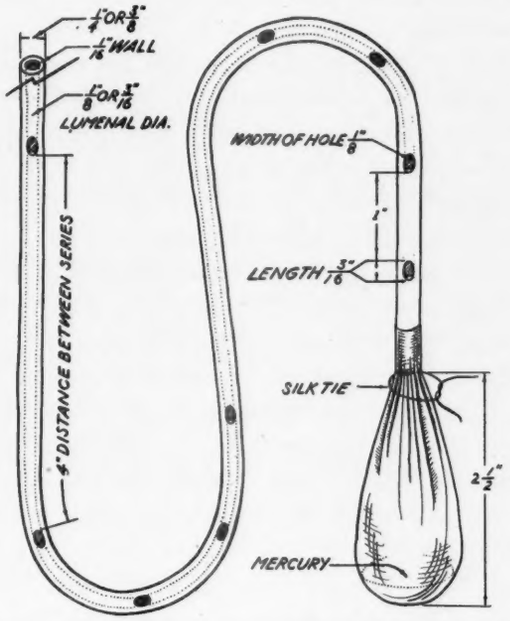

FIG. 3. This is a diagram of the tube giving the dimensions of its various features. Holes are in groups of four.

When one considers the problem of intestinal decompression, it resolves itself down to the ability of the surgeon to introduce a tube of soft rubber far down the gastrointestinal tract. To decompress the bowel adequately, this tube must have a lumen sufficiently large that the gases and small particulate matter found in the gastrointestinal tract could be easily suctioned out and yet the tube not become plugged. It would be further desirable to have a sufficient number of holes all along the tube so that the gastrointestinal tract could be decompressed all along the course of the tube, each hole to be sufficiently large that the danger of it becoming plugged would be reduced to a minimum. By the use of such a tube, using the principle of suction one could easily decompress the entire gastrointestinal tract.

With these facts in mind, we took a single lumen tube ten feet long and fastened a rubber condom to the end of it. The lumenal diameter of the tube was three-sixteenths of an inch and the thickness of the wall of the tube three sixty-fourths of an inch. Four series of holes were made in

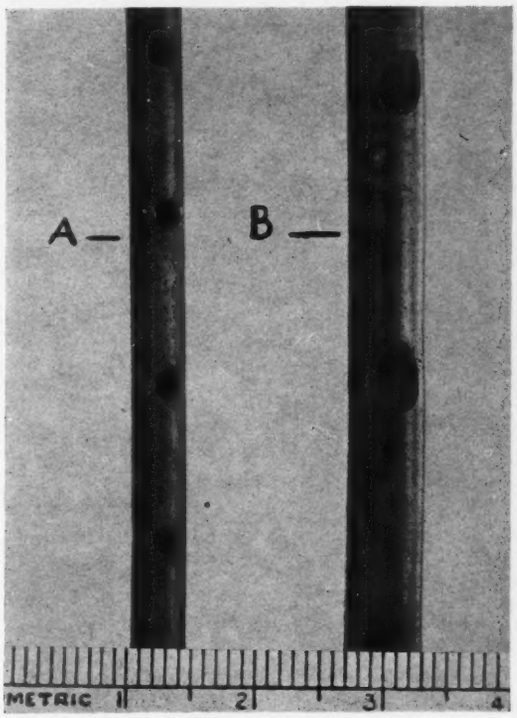

FIG. 4. Note the difference in size and shape of the holes in the Miller-Abbott tube (A), and our tube (B). 2 X.

the tube beginning just above the balloon and running upward for twenty-four inches. The holes were made in groups of four. Each hole being separated from the next to it by one inch. Each series was separated from the next by four inches. (Fig. 3.) In this way, the series of holes were made to run proximally from the end of the tube for a distance of twenty-four inches. The holes were made elliptical in shape, being one-eighth of an inch wide and three-sixteenths of an inch long. The greatest diameter of the hole being along the length of the tube. (Fig. 4.) By making the holes in this fashion we found that plugging was much less likely to occur. After much experimentation, it was found that the optimum length of the balloon must be two and one-half inches. This length permitted the mercury to move about freely and so facilitated the passage of the tube and yet was not so long that it would swing around a loop of tube

in the stomach and so form a knot. This knotting was particularly prone to occur if the condom was made too long or if too much tube was passed into the stomach before the condom had passed through the pylorus. Before being used 5 cc. of mercury was inserted into the condom through the hole just above it, the air present was then forced out, and the neck of the condom was tied off with braided silk just distal to the end of the tube to prevent the escape of the mercury. (Fig. 5.) The single lumen intestinal decompression tube was now ready to be used.

FIG. 5. This is a photograph of the entire tube. It does not show the silk ligature which is tied just below the end of the tube after the mercury has been inserted. This must be done immediately preceding the insertion of the tube into the patient and after all the air has been forced out of the balloon.

The method of passing the tube was found to be important. Excellent results were obtained in every case in which attention was given to a few simple details. For this reason the following instruction sheet was sent with each tube:

1. Give the patient morphine sulfate gr. 1/6 and atropine sulfate gr. 1/150 one-half hour before attempting to pass the tube. This will allay nervousness and also relax the pyloric sphincter.

2. Apply pontocaine 2 per cent to the mucosa of the side of the nose through which the tube is to pass.

3. Lubricate the tube well with mineral oil or some other lubricant.

4. Have the patient lie flat on his back with his neck hyperextended thus throwing the head backward. Then insert the condom into the nose and permit the mercury to run into it while feeding the rest of the condom into the nose. When the entire condom is in the nose, the weight of the mercury will pull the tube down the nasopharynx. Permit the patient to sit up, and have patient drink some water. This will facilitate the rapid passage of the tube downward through the esophagus into the stomach. At this time gently pass the tube downward to a point four inches beyond the last visible hole.

5. With the tube in the stomach, have the patient lie on his right side without a pillow and elevate the foot of his bed ten to twelve inches. Keep in this position for two hours.

6. At the end of two hours, level the bed, and turn the patient upon his back and put up the backrest (Fowler's position). Keep the patient in this position for two hours.

7. At the end of two hours, turn the patient upon his left side while on the backrest. Permit him to lie in this position for two hours.

8. Following this, permit the patient to move about freely and encourage sitting up in bed or permit the feet to dangle. Get a portable check film in twenty-four hours.

Since the holes in the tube extended upward for twenty-four inches from the end of the tube, when the last hole came to lie at the external nares, about ten inches of the tube would be in the stomach. This is so because the stomach is about eleven inches from the teeth and the tube passing through the external nares and nasopharynx would add an additional three inches, thus leaving ten inches of the tube in the stomach at this point. Because the intragastric pressure would quickly cause

the stomach contents to leak over the patient, it was found necessary to insert four to six more inches of the tube at this time. The last hole would now lie in the esophagus and all the patients were very comfortable, while at this time about fourteen inches of tube would be found in the stomach. This would not produce coiling and so the danger of knot formation would be negligible. By this technic, the weight of the mercury and its volatility causes the balloon to be carried toward the funnel-mouth of the stomach, i.e., the pylorus. It readily passes through the pylorus so that on the twenty-four hour *x*-ray film it will invariably be found well down the gastrointestinal tract. If the nares of the patient is small, a tube of one-eighth lumenal diameter is used. In this tube the holes are made smaller. In all other respects the tubes are the same.

The four series of large holes very easily decompress the bowel about the tube using the principle of suction to secure even decompression. The caliber of the holes in the tube and the shape of the holes is sufficiently large to take care adequately of most of the particulate matter found with the liquid in the bowel. Plugging of a tube of this caliber is most infrequent. The four series of holes decompress the bowel far more efficiently than by the use of the Miller-Abbott or Johnston tubes whose lumenal diameters and the size or whose holes is much smaller. By shifting the patient about in the positions previously enumerated, the full use is made of the effect of gravity upon the heavy metal (mercury) in the condom. This effect literally "drags" the tube down into the gastrointestinal tract. The condom containing the mercury acts like a bolus and also stimulates peristaltic activity in the collapsed bowel. In some cases of bowel obstruction in which the Miller-Abbott tube is permitted to remain for many days, it has been noted by many surgeons that a secondary dilatation of the stomach is not infrequent. This necessitates the passage of a Levin tube through the other nares in order to secure gastric decompression. With our type of tube this does not occur, since withdrawing the tube a short distance results in the last holes falling in the stomach and so adequately produce decompression. On the other hand, a fifth series of holes can easily be made in this complication and made far enough above the fourth group as to fall in the stomach even when the balloon is found in the ascending colon. (Fig. 2.)

TABLE 1
SUMMARY OF CASES—TWENTY-TWO

Patient	Age	Sex	Pathological Condition	Condition of Patient in Hours
1. H. A.	60	M	Peritonitis (ruptured appendix)	Excellent—24
2. T. M.	50	M	Bowel obstruction (cancer of colon)	Excellent—24
3. F. L.	50	M	Peritonitis (ruptured gastric ulcer)	Excellent—24
4. H. G.	62	F	Bowel obstruction (cancer of uterus)	Excellent—24
5. S. S.	60	F	Peritonitis (ruptured appendix)	Excellent—48
6. A. L.	45	F	Bowel obstruction (postoperative)	Excellent—48
7. M. Y.	63	M	Atonic ileus (retroperitoneal abscess)	Excellent—48
8. B. C.	48	F	Peritonitis (evisceration)	Excellent—48
9. J. B.	55	F	Bowel obstruction	Excellent—24
10. J. R.	65	M	Bowel obstruction (carcinoid of ileum)	Excellent—48
11. M. K.	45	M	Peritonitis (ruptured appendix)	Excellent—48
12. W. P.	50	M	Bowel obstruction	Excellent—48
13. D. C.	73	M	Peritonitis (ruptured appendix)	Excellent—48
14. M. V.	42	F	Bowel obstruction	Excellent—48
15. A. W.	56	F	Atonic ileus (pyelonephritis)	Excellent—48
16. C. C.	46	F	Bowel obstruction	Excellent—48
17. W. S.	25	F	Pancreatitis (atonic ileus)	Excellent—48
18. V. J.	70	M	Bowel obstruction	Excellent—48
19. R. F.	28	M	Peritonitis (ruptured appendix)	Excellent—48
20. I. G.	70	M	Intestinal obstruction	Excellent—48
21. A. K.	46	F	Intestinal obstruction (adhesions)	Excellent—48
22. A. W.	55	F	Atonic ileus (postoperative)	Excellent—24

SUMMARY

Since it has been demonstrated that mercury in a balloon tipped tube will carry the tube down the gastrointestinal tract, there is no longer the need for a double lumen tube. We have presented twenty-two cases of severe intestinal distention which were treated by a single lumen intestinal tube and in which the results were far better than our expecta-

tions. In all cases, the tube was carried far down the ileum or into the colon by the mercury. The caliber of the lumen in the tube used is considerably larger than in the currently used tubes and the number of holes were increased to sixteen. These sixteen holes are spread over an area of twenty-four inches. The size of the holes are also much larger than in any of the currently used tubes and the shape of the holes, we believe, contributes immeasurably to the excellent results obtained as plugging with particulate matter did not occur. Only one word of caution must be uttered at this time; that is, *after the last hole has been inserted into the nose, do not insert more than six inches of tube until the balloon has passed through the pylorus and into the duodenum.* It takes one to two hours for the balloon to pass into the duodenum, then the tube is advanced six inches every two hours. If too much tube is inserted into the stomach before the balloon has passed into the duodenum, coiling of the tube will occur with the resultant danger of knot formation.

CONCLUSION

1. A single lumen tube with a lumen of three-sixteenths of an inch has been found to be the most efficient instrument to induce intestinal decompression.

2. In patients with a small nasal passage, a tube with a narrower lumen can be used. In this type of case, a tube having a lumenal diameter of one-eighth inch can be used efficiently. In such a tube, the holes are made smaller but the number of holes remains the same.

3. A single lumen tube of the type we propose is much easier to pass than any other in use. It causes the patient no more discomfort than the smaller caliber tubes.

4. The series of holes along the course of the tube insures that decompression takes place all along the gastrointestinal tract and pocketing is less likely to occur.

5. There is very little danger of plugging of the tube.

6. The balloon invariably comes to lie in the terminal ileum or ascending colon.

I should like to express my appreciation to Dr. C. S. Kennedy without whose support this work could not have been done. All the tubes used were under the direction of Dr. Aulie and Dr. Burnham (surgical residents at Grace Hospital). Dr. H. Jarre of the *x*-ray department was very kind with most helpful suggestions.

REFERENCES

1. Wangensteen, O. H. Intestinal Obstruction. 2nd ed. Springfield, Ill., 1942. Charles C. Thomas Co.
2. Miller, T. G. and Abbott, W. O. Intestinal intubation, a practical technique. *Am. J. M. Sc.*, 187: 595–599, 1934.
3. Matheny, D. and Hutchins, L. R. The use of gravity and the wangensteen tip in Miller-Abbott intubation. *West. J. Surg.*, 50: 618–619, 1942.
4. Abbott, W. O. Indications for the use of the Miller-Abbott tube. *New England J. Med.*, 225: 641–646, 1941.
5. Mayer, H., Jr. Passage of Miller-Abbott tube through pylorus with the aid of electro-magnet. *U. S. Naval. Med. Bull.*, 43: 463–466, 1944.
6. Johnson, C. G. Personal communication.
7. Harris, F. I. New rapid method of intubation with Miller-Abbott tube. *J. A. M. A.*, 125: 784–785, 1944.
8. Swertsen, I. Reported by Harris, F. I. *J. A. M. A.*, 126: 718, 1944.
9. Wilkins, J. A. Mercury weighted stomach tube. *J. A. M. A.*, 91: 395–396, 1928.

Note: Since this paper was submitted for publication, the number of holes in the tube has been reduced to twelve by reducing the series of holes to three series of four holes each. The tube was then used in twenty additional cases with excellent results.

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The project is sponsored by the American College of Surgeons, is made possible by a grant from the Armour Laboratories and is edited by John H. Glynn, M.D. and Florian E. Schmidt, M.D. of the professional staff.

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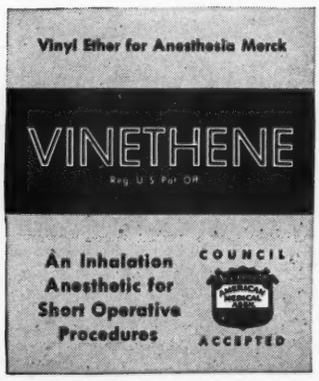

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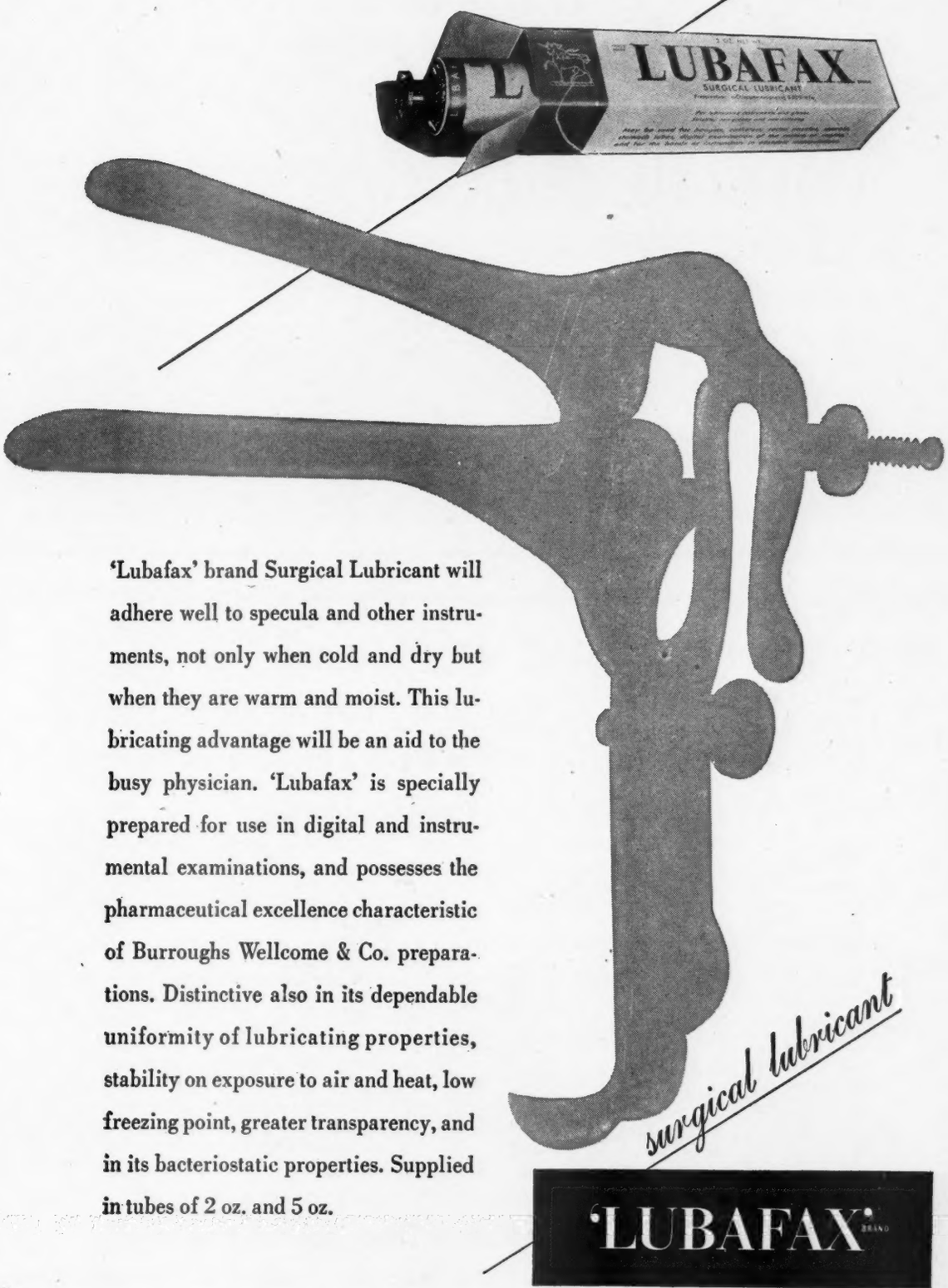

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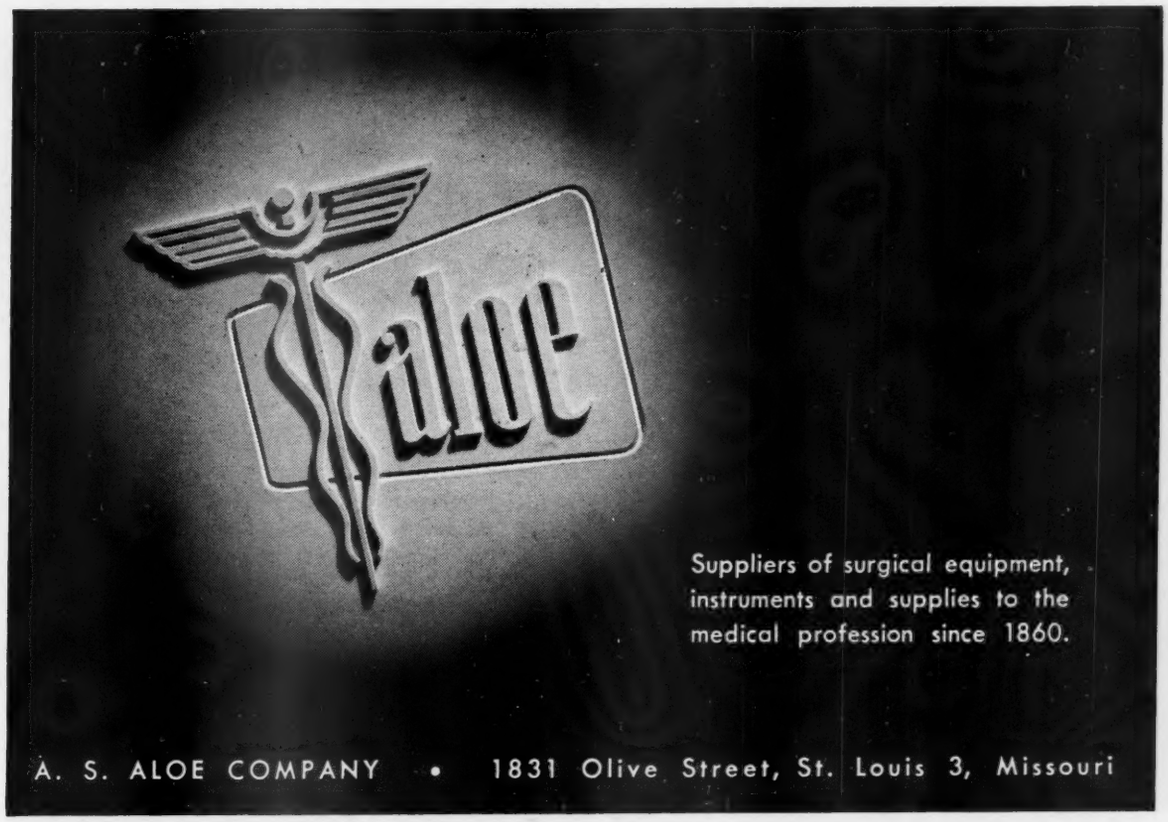
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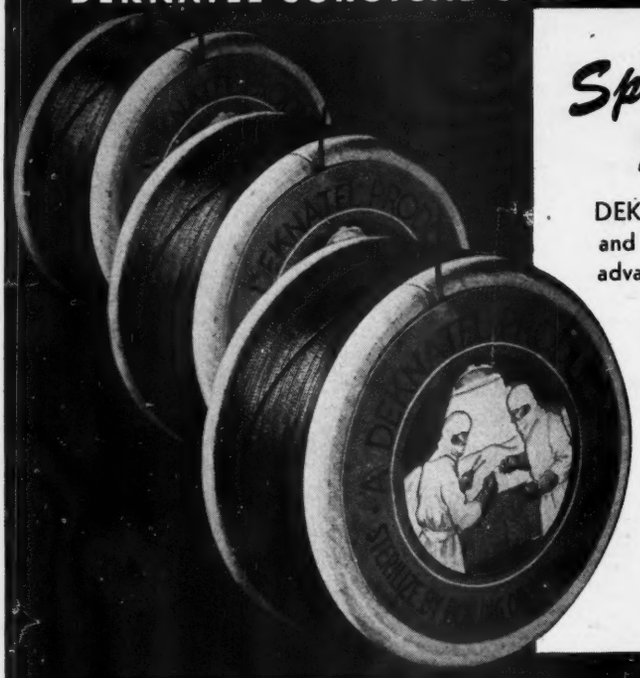

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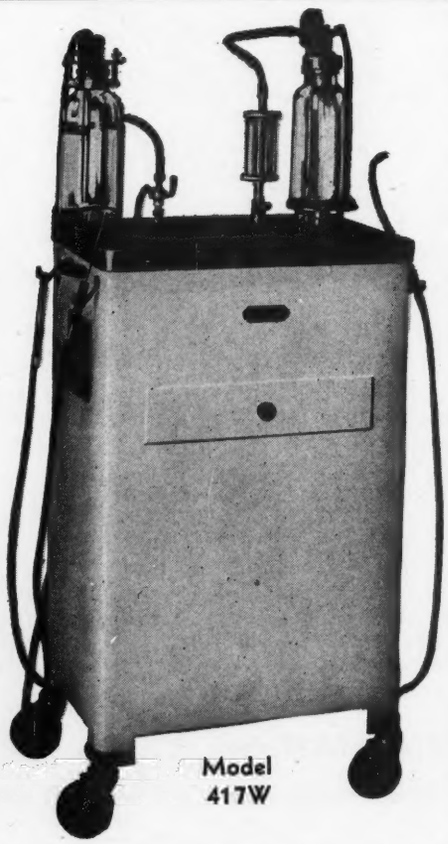

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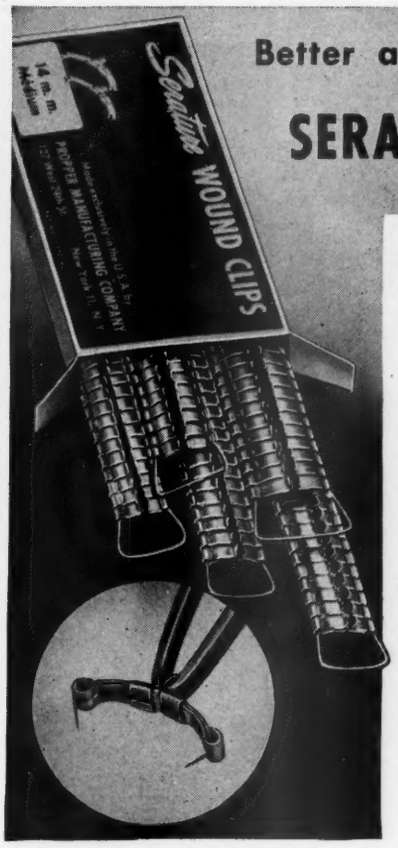

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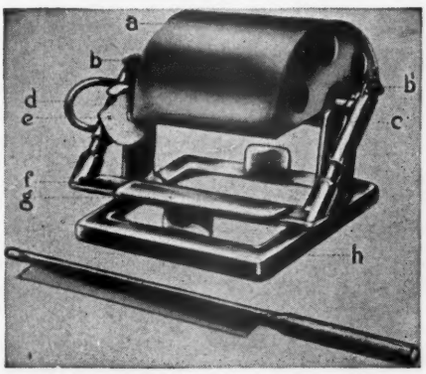

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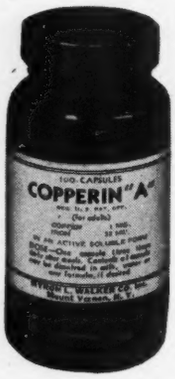

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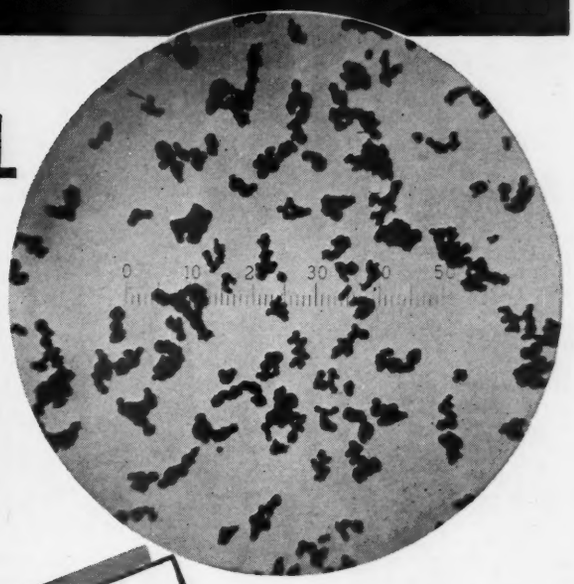

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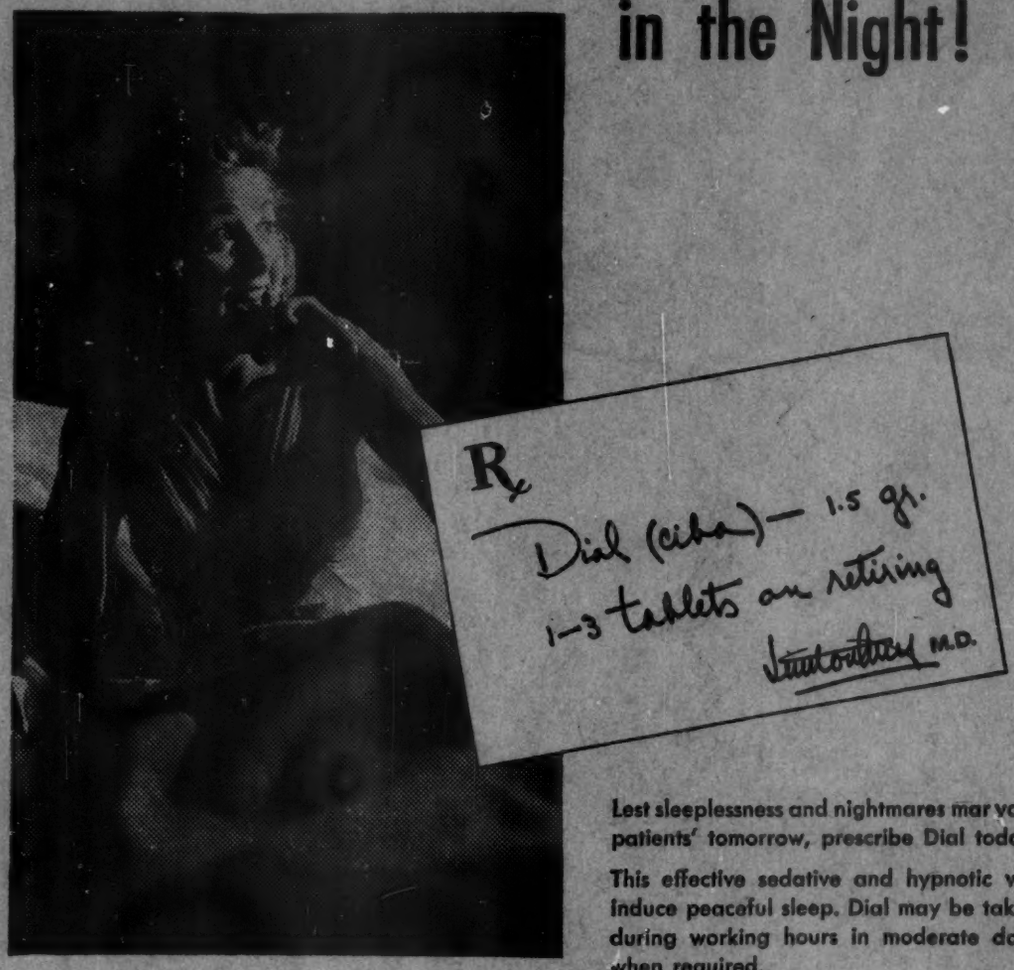

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